



STANDARD DETAIL AND SPECIFICATIONS MANUAL

September 1, 2008

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WET DETENTION BASIN DESIGN
DRY DETENTION BASIN DESIGN

FIGURE 1
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**SECTION 1.00
DEFINITIONS AND ABBREVIATIONS**

1.01 DEFINITIONS

CONTRACTOR	The successful Bidder to whom a contract has been awarded and who has executed the contract documents.
EASEMENT	A property right to use or control real property of another.
ENGINEER	The Town Engineer of the Town of Smithfield, an assistant, or other representative duly authorized by the Town Engineer.
INSPECTOR	The Construction Inspections Administrator, an assistant, or other representative duly authorized by the Director of the Construction Management Department.
INVERT	The lowest point in the internal cross section of a pipe or other culvert.
PLANS	The approved plans, profiles, standard details, supplemental plans, and working drawings, which show the location dimensions, and details of the work to be done.
RIGHT OF WAY	The land area between the back of curb or edge of pavement and the property boundary and including the area containing the street.
STANDARD SPECIFICATIONS	The general term comprising all the directions, provisions, and requirements contained or referred to in this book entitled "Smithfield Standard Specifications and Details" and in any subsequent revisions or additions to this book.
SUBGRADE	That portion of the roadbed prepared as a foundation for the pavement structure.


1.02 ABBREVIATIONS

ASSHTO	American Association of State Highway and Transportation Officials
A.B.S	Acrylonitrile Butadiene Styrene
A.F.F	Above Finish Floor
ANSI	American National Standards Institute
ASTM	American Society of Testing and Materials
AWWA	American Water Works Association
F.	Fahrenheit
ft.	foot
gpd	gallons per day
ID	Internal Diameter
lbs.	pounds

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MSL	Mean Sea Level
MUTCD	Manual on Uniform Traffic Control Devices
NCDEH	North Carolina Division of Environmental
NCDEHNR	North Carolina Department of Environment, Health & Natural Resources
NCDEM	North Carolina Division of Environmental Management
NCDOT	North Carolina Department of Transportation
N.E.C.	National Electric Code
NFIPA	National Fire Protection Association
NYDOT	New York Department of Transportation
OD	Outside Diameter
P.C.	Point of Curvature
P.E.	Professional Engineer
PPM	parts per million
psi	pounds per square inch
P.T.	Point of Tangency
PVC	Polyvinyl Chloride
P.V.C.	Point of Curvature on Vertical Curve
P.V.T.	Point of Tangency on Vertical Curve
Q(max)	maximum discharge
Q(min)	minimum discharge
RH	Relative Humidity
RLS	Registered Land Surveyor
SCS	Soil Conservation Service
sec.	second
s.f.	square feet
SU	Single Unit Truck (with 20 feet wheelbase and 30 overall length)
UL	Underwriters' Laboratories, Inc.
V	volts
VAC	Voltage – Alternating Current

END OF SECTION 1.00

	
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**SECTION 2.00
GENERAL PROVISIONS**

2.01 GENERAL

All construction shall conform to the requirements and dimensions on the construction plans, Town Standard Details, the Code of the Town of Smithfield, or as stated in these specifications. The design of streets, water systems, sanitary sewer systems, storm drainage systems, and grading plans shall be signed and sealed by a licensed North Carolina Professional Engineer, Registered Land Surveyor, Architect or Landscape Architect in accordance with N. C. General Statute 89.

2.02 QUALITY OF MATERIALS

It is the intent of this specification to provide materials of the highest standard known to the trade and to provide materials free from defects in workmanship and product. Equal material not specified may be used provided documentation and samples necessary for the Engineer to determine the acceptability and **ISSUE A WRITTEN APPROVAL** are provided to him a **MINIMUM** of 14 **DAYS** before being brought onto the construction site. Current specifications and/or the latest revision shall apply in all cases where materials are described by these specifications.

2.03 INSPECTIONS

The Contractor shall provide the necessary manpower and equipment required as a part of the inspection process. The presence of the Engineer or Inspector at the work site shall in no way lessen the Contractor's responsibility for conformity with the plans and specifications. Should the Engineer or Inspector accept materials, or work that does not conform with plans and specifications, whether from lack of discovery or for any other reason, it shall in no way prevent later rejection or corrections to the unsatisfactory materials or work when discovered. The Contractor shall have no claim for losses suffered due to any necessary removals or repairs resulting from the unsatisfactory work. Any work which has been covered without the Inspector's approval, shall, at the Inspector's request, be uncovered and be made available for inspection at the Contractor's expense. Work performed before or after Town staff's normal work hours or during the weekend or Town Holidays shall comply with the Town Code and shall include only such tasks that do not require observations by an Inspector.

If during the process of routine inspection of a project and related infrastructure begin installed under these regulations, it is found that improper or substandard materials or construction methods are being used or if significant deviation from the approved construction plans is detected, the Town reserves the right to assign a utility inspector to the project. The Inspector shall have authority to act on behalf of the Town in checking all construction for compliance with State and Local standards. The Inspector shall also have the authority to halt any work not meeting Town standards and specifications. Once assigned, the Inspector shall perform minimum of three (3) hours of on-site inspections per work day. All costs associated with the Inspector shall be the responsibility of the Owner and shall be billed accordingly by the Town.

2.04 CLEARING AND GRUBBING

The work of clearing and grubbing shall consist of the cutting, removal, and

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satisfactory disposal of all vegetation and all surface debris. Clearing and grubbing shall be conducted in a manner to prevent damage to vegetation that is intended to remain growing and also to prevent damage to adjacent property.

2.05 EARTHWORK

Earthwork shall be defined as removal of earth or soft rock from its natural location or as the depositing of such material into the proper fill areas as designated on the plans.

Rock excavation shall be defined, in the opinion of the Engineer, as all ledge rock or boulders over 0.5 cubic yard that cannot be excavated without blasting.

A written PERMIT FOR BLASTING must be obtained from the Smithfield Fire Department a MINIMUM of 24 hours before any explosive material or blasting agents are transported into the Corporate Limits of Smithfield.

Fill Material shall be free from construction material, debris, frozen material, organic matter or unstable material.

For the top two feet below finished subgrade, no fill material shall be used weighing less than 100 pounds per cubic foot. The top TWO FEET of backfill material shall be free from stones greater than 4 inches.

For all areas under a proposed roadway, the top twelve (12) inches of subbase, and the entire base course shall be compacted to a density of 100 PERCENT maximum Standard Proctor dry density as determined by AASHTO method T99. For that portion of fill under roadways and extending at a slope of 1 to 1 beyond the back of curb, compact to a density of No LESS THAN 95 PERCENT of the maximum Standard Proctor dry density as determined by AASHTO method T99. Fill material shall be placed in lifts of 8 inches or less of uncompacted soil.

Other fill material shall be compacted to a density of No LESS THAN 90 PERCENT of the maximum Standard Proctor dry density as determined by AASHTO method T99. Backfill material shall be placed in lifts of 12 inches or less of uncompacted soil.

2.06 MAINTENANCE OF TRAFFIC

A. General

When construction occurs in a traffic zone, traffic control devices must be erected, maintained, relocated, and removed in accordance with the plans, specifications, NCDOT Supplement to the MUTCD, or MUTCD. This requirement shall apply for all construction occurring on public streets, including construction or repairs by utility companies. The MUTCD referred to in this provision the current edition of the Manual on Uniform Traffic Control Devices for Streets and Highways, as prepared by the National Advisory Committee on Uniform Traffic Control Devices, including all standard documents referred to in Section 1A-7 of the MUTCD. The current edition shall be the edition current at the time of construction.

Traffic control devices shall include but not be limited to signs, drums, barricades, cones, delineators, flashing arrow panels, temporary guardrail, temporary concrete median barrier, vehicle-mounted temporary impact attenuators, pavement marking, raised reflective pavement markers, flaggers and pilot vehicles.

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B. Materials

Unless otherwise required, materials used in the fabrication and installation of construction traffic control devices shall be in accordance with the applicable provisions of the MUTCD.

All enclosed lens (Engineers Grade) sheeting required for use on traffic control devices shall have an identification mark on the surface. This mark signifies that the sheeting meets the requirements of Federal Specification L-S-300C for Minimum Reflectivity I Sheeting and Tape. The identification mark shall not interfere with the function of the device, but shall be visible both day and under illumination at night without the use of special devices.

C. Installation and Maintenance

Existing public streets or highways shall be kept open to traffic at all times by the Contractor unless permission to close the street, or portions thereof, is granted by the Town Engineer. The Town of Smithfield Police Department must be contacted BY THE CONTRACTOR A MINIMUM OF 24 HOURS before any streets are closed or partially closed.

Work on any project shall not start until all traffic control devices required for the particular work activity are properly installed.

Traffic control devices shall be properly maintained, relocated as necessary, cleaned and operated during the time they are in use. During periods when use of the devices is not warranted, they shall be removed from the work area, covered, or otherwise positioned so that they do not convey their message to the traveling public. The location, legends, sheeting, dimension, number of supports, and horizontal and vertical placement of warning signs, barricades, and other traffic control devices shall be as required by the plans or the MUTCD.

Weeds, brush, trees, construction materials, equipment, etc. shall not be allowed to obscure any traffic control device in use.

Competent and properly trained, attired and equipped flaggers, using "stop" and "slow" paddles shall be provided when two-way traffic cannot be maintained.

The Contractor shall assume full responsibility for the continuous and expeditious maintenance or replacement of all construction warning signs, barricades, and other traffic control devices. The Contractor shall continuously review and maintain all traffic control measures to assure that adequate provisions have been made for the safety of the public and workers. Failure to maintain all traffic control devices in a satisfactory condition shall be cause for suspension of construction operations until proper traffic control is re-established.

2.07 CONCRETE

Concrete shall be only plant-mixed or transit-mixed concrete conforming to ASTM C33 for aggregates and to ASTM C94 for ready-mixed concrete. Any concrete poured that has a slump over 4 inches as per ASTM C143,

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or has a batched time of more than 90 minutes, will be considered unacceptable. Concrete shall not be deposited on frozen subgrade. Concrete shall not be poured when the air temperature is falling below 40 degrees Fahrenheit, and the predicted low temperature for the succeeding 24 hour period is less than 32 degrees Fahrenheit.

All concrete when placed in the forms shall have a temperature of between 50 and 90 degrees Fahrenheit and shall be maintained at a temperature of not less than 50 degrees Fahrenheit for at least 72 hours for normal concrete and 24 hours for high early strength concrete, or for as much time as is necessary to secure proper rate of curing and designed compressive strength.

Concrete shall be air entrained with 5-7 % air. Retarders and accelerators shall be used only as directed by the Engineer.

2.08 PERMITS

During the course of design, and prior to any construction, all permits or approvals shall be obtained from the appropriate Town, State or Federal agencies, as applicable. These shall include but shall not be limited to:

1. Site Plan Approval – Town of Smithfield
2. Subdivision Plat Approval – Town of Smithfield
3. Burning Permit – Town of Smithfield
4. Sedimentation and Erosion Control – NCDEHNR
5. Water System Extension – NCDEH
6. Sewer System Extension – NCDEM
7. NCDOT Encroachment/Driveway Permit – NCDOT
8. Wetlands Disturbance – US Army Corps of Engineers

2.09 ACCEPTANCE PROCEDURES

All improvements intended for public maintenance are eligible for acceptance by the Town of Smithfield following the procedures outlined below:

After the installation of improvements in accordance with Town Council approved plans and Town Standard Specifications and Details, the Owner/Developer or designee shall contact the Town and schedule a completion (final) inspection.

The Town will accept the improvements or respond with a punch list within 30 days of the request.

The Owner/Developer or designee must complete all items indicated on the punch list, and any additional items noted, within 60 days or the punch list will be void. The Owner/Developer or designee must then request another completion (final) inspection.

Upon the acceptable completion of all punch list items and payment of any outstanding fees, the Owner/Developer or designee will receive an acceptance letter from the Town of Smithfield. This acceptance begins a warranty for materials and workmanship for not less than one year from the date of acceptance. The warranty will be to the Town from the owner/Developer or designee. The Town will perform routine maintenance during the warranty period.

Upon completion of, or just prior to the end of, the warranty period, the Owner/Developer or designee shall request a final inspection from the Town.

 	
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The Town will respond with final acceptance or a punch list on workmanship or materials within 30 days of the request.

The owner/Developer or designee must complete all items indicated on the punch list, and any additional items noted within 60 days or the punch list will be void. The Owner/Developer or designee must then request another final inspection.

Upon the acceptable completion of all punch list items, the Owner/Developer or designee will receive a letter of acceptance from the Town. The Town will begin total maintenance as of the date of the final acceptance letter. Until a letter of final acceptance has been issued, all materials and workmanship are the responsibility of the Owner/Developer.

Until a letter of final acceptance has been issued, all materials and workmanship are the responsibility of the Owner/Developer.

2.10 PLANTINGS WITHIN TOWN UTILITY EASEMENTS

An "easement" shall mean any area to which the Town has unlimited access for servicing utility lines. Any plantings installed within an easement may be damaged or destroyed during the course of servicing. The Town is not liable for damage to plantings within an easement. The Town will reseed as necessary any bare or disturbed soil for erosion control purposes.

Small and medium shrubs, groundcovers, or grasses may be planted within an easement.

Small trees (under 30 feet in height at maturity) may be planted a minimum of 10 feet from the centerline of the closest pipeline within the easement or 10 feet from the center of the easement, whichever is greater. Small trees as defined above shall include redbuds, fringe tree, serviceberry, crape myrtle, golden raintree, Hawthorne, hornbeam, saucer or star magnolia, sassafras, smoke tree, sourwood or sumac.

Large trees shall not be placed within any Town utility easement.

2.11 LICENSE REQUIREMENTS

All contractors performing any construction activity involving the Town of Smithfield utility system or street system shall be licensed to practice general contracting in the State of North Carolina. The contractor shall be classified in the appropriate area of license for the type construction to be performed and shall not perform construction activity which exceeds the limitations of the designated contractor's license.

2.12 RETAINING WALLS

All retaining walls with a height of five (5) feet or greater must be designed by either an architect or professional engineer and shall be signed and sealed. The design shall be submitted to the Engineering Department for approval prior to construction. All necessary permits (e.g. building permit) must be obtained prior to any construction associated with the retaining wall.

2.13 OSHA STANDARDS

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All contractors and their employees must comply with all OSHA standards while working on Town projects and while on Town of Smithfield property or rights of way.

2.14 SAFETY AND HEALTH HAZARDS

The operations of any Town contractor shall not expose Town of Smithfield employees to any hazardous chemicals or other occupational safety and health hazards. All contractors working on Town projects or on Town of Smithfield property shall inform the project engineer concerning hazardous chemicals which the contractor might be using and to which Town employees might become exposed by working in that area.

The contractor shall also advise the Town of the appropriate control measures to be used by the Town employees to prevent exposure and to minimize risk of exposure.

END OF SECTION 2.00

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**SECTION 3.00
STREETS**

3.01 GENERAL

The latest revision of the "Standard Specifications for Roads and Structures" of the North Carolina Department of Transportation shall apply unless otherwise specified herein.

Whenever the following terms are used in above said specifications the intended meaning of such terms shall be as follows:

"State" or "Commission" shall be replaced by "Town of Smithfield".

"Resident Engineer" shall be replaced by the words "Town Engineer", in which context it shall mean the duly authorized Engineer, assistant, or representative acting within the scope of the duties assigned or of the authority given by the Town Manager.

"Sampling and testing by Commission" shall be replaced by the words "sampling and testing by the Town or its authorized testing agent".

"Inspection by Commission" shall be replaced by "Inspection by Town or its duly authorized representative".

3.02 DESIGN

All streets (private and public) shall be designed and constructed to Town of Smithfield Standard Specifications and Details unless NCDOT Standard Specifications are applicable. NCDOT standards shall be used on all existing state roads, extensions of existing state roads, or roads to be maintained by NCDOT.

A. Street Classifications for Street Specifications

- Superhighway Major thoroughfares consisting of interstates, freeways, expressways or parkway links that are characterized by limited access control.
- Major Arterial A major street in the city's street system that serves as an avenue for the circulation of traffic into, out, or around the city and carries high volumes of traffic. It is designed to carry more than twelve thousand (12,000) but less than twenty-four thousand (24,000) trips per day.
- Minor Arterial A major street in the city's street system that serves as an avenue for the circulation of traffic into, out or around the city and carries high volumes of traffic. It is designed to carry more than five thousand (5,000) but less than twelve thousand (12,000) trips per day.

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Collector A street whose principle function is to carry traffic between minor, local and subcollector streets and arterial streets but that may also provide direct access to abutting properties. It is designed to carry more than two thousand (2,000) but less than five thousand (5,000) trips per day. Typically, a collector is able to serve, directly or indirectly, between two hundred and fifty (250) and five hundred (500) dwelling units.

Subcollector A street whose principle functions are both the carry traffic between minor and local streets and collectors, or to join two collectors, or a collector and an arterial, and to serve abutting properties. It is designed to carry more than five hundred (500) but less than two thousand five hundred (2,500) trips per day. Typically, a subcollector is able to serve, directly or indirectly, between fifty (50) and two hundred fifty (250) dwelling units.

Local Road A street whose sole function is to provide access to abutting properties. It is designed to carry more than one hundred fifty (150) but less than five hundred (500) trips per day. Typically, a local road is able to serve, directly or indirectly, between fifteen (15) or fifty (50) dwelling units.

Minor Street A street whose sole function is to provide access to abutting properties. It is designed to carry one hundred fifty (150) or less trips per day. Typically, a minor street serves fifteen (15) or fewer dwelling units.

Alley A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back or side of properties otherwise abutting on a street. Alleys shall be permitted and constructed where deemed necessary by the town in relation to the type of development proposed and shall meet the following requirements:

- a. Right-of-way 20 feet
- b. Minimum centerline radius when a deflection angle of more than 10 degrees occurs 35 feet
- c. Property line radius at alley intersections 15 feet
- d. Dead-end alleys shall be provided with a turnaround in accordance with Town Standards.
- e. No alley shall have access from a major street or highway, but shall have access points confined to minor streets whenever practicable.

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Design Aspect	Minor	Local	Sun-Collector	Collector	Arterial	Superhighway
R/W with C/G 150	50	50	60	70		100
Pavement Width N/A with C/G	27	27	34	37		49
Pavement Width With C & G	N/A	N/A	N/A	N/A	N/A	60
Sidewalks	No	No	1 side	1 side	2 sides	N/A
Design Speeds	20	25	35	35	45	55
Slope or Grade	10	10	8	8	8	8

Notes:

Slopes are maximum slope in percent change in elevation.

Yes means required; No means not required;

N/A means not allowed.

Pavement widths on curb and gutter sections are from back to back of curb.

Curb and gutter shall be required on all streets except where specifically authorized otherwise by the Town Council.



B. Horizontal Street Design

All streets shall conform to the mutually adopted Smithfield–Selma–Pine Level Thoroughfare Plan when applicable or shall be designed and located in proper relation to existing streets and environment. Collector streets and arterials shall be as directional as possible but consistent with topography and preserving developed properties and community values.

Residential streets shall be designed to discourage high speed traffic and minimize excessive cuts, excessive fills and cut through traffic.

A minimum tangent of 150 feet is required between reverse curves for major streets, highways, and collector streets. This tangent shall be extended as necessary to provide the minimum runoff lengths for the curves superelevation per AASHTO guidelines. A 100 foot minimum tangent distance will be required between reverse curves for all minor streets. The minimum tangent length of an approaching intersection should be thirty (30) feet for residential streets. All intersections of streets classified as collector or greater shall have a tangent section not less than 100 feet approaching the intersection.

Compound horizontal curves with the same direction of curvature shall have the radius of the flatter circular arc no more than one and one half times the radius of the sharper circular arc. Streets shall intersect each other at right angles whenever possible. The minimum desirable intersection

 	
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angle is eighty (80) degrees. At no time shall a street intersect any other street at less than sixty (60) degrees.

Intersections with a major street or highway shall be at least 800 feet apart. There shall be a minimum of 200 feet between centerlines of street jogs on collectors and major streets. All other access streets shall not be offset less than 150 from their centerline.

Superelevation is to be used on all arterials and collectors. Superelevation shall conform to NCDOT and AASHTO standards for superelevation design.

Tapers shall be used as necessary in street design. Approach tapers are used to shift lanes laterally. The following equations shall be used as applicable:

- L = WS for posted speeds of 45 mph and greater;
- L = WS(sq) for posted speeds of 45 mph or less; 60
- L = Length in feet
- S = Speed in miles per hour
- W = Lateral offsets in feet.

Turn bay tapers shall be at least 15:1 for posted speeds of 45 miles per hour and more. The minimum turn bay taper allowed is 8:1. Symmetrical reverse curve tapers are recommended for non-arterial streets. Storage lengths for the turn bays shall be calculated using an acceptable method.

Streets with medians shall be designated to allow for proper turning movements for a SU (single unit truck) design vehicle. AASHTO guidelines should be followed for the actual median design and median opening dimension.

C. Vertical Design

Street grades shall be established with respect to existing topography to avoid excessive grading and the removal of existing trees and vegetation whenever practical.

The minimum grade allowed on any street shall be one-half of one percent. (1/2%).

The maximum grade allowed when approaching an intersection is five percent (5%) for the last 100 feet of pavement before the intersection.

D. Geometrics

Radii

A minimum radius of 25 feet to the back of curb shall be required where residential streets intersect.

A minimum radius of 30 feet measured to the back of curb shall be required where a residential street intersects with a non-residential street.

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It is recommended that the designer consider larger radii or 3-centered compound curves where needed to provide for turning movements of larger vehicles.

A minimum radius of 40 feet will be required where collectors intersect thoroughfare streets.

Cul-de-sacs

Cul-de-sac dimensions shall be as shown in Town of Smithfield Standard Detail 3.08.

A cul-de-sac radius shall be a minimum of 40 feet. The standard maximum length for a cul-de-sac shall be 500 feet. The length may be modified depending upon the density within the subdivision. The modification must be approved by the Town Council upon recommendation by the Town Engineer and public safety officials. The recommendation shall consider the development density, land configuration, as well as all safety concerns. The length of a cul-de-sac shall be measured from the last point of alternate access within the subdivision. No median shall be allowed in a 40 foot radius cul-de-sac. A median may be permitted where the cul-de-sac radius is increased and it can be demonstrated that all emergency vehicles can be readily accommodated.

Driveways (Non-residential)

Standard concrete driveway aprons as shown in Standard Detail 3.15 shall be used when the ADT for the driveway is less than 500 vehicles.

Street type turnouts shall be used when the driveway ADT is greater than 500 vehicles or when access by larger trucks must be accommodated. A minimum radius of 25 feet shall be used on all street type turnouts. Street type driveways shall have a minimum width travel lane of 22 feet. Any curb and gutter used will be in addition to the 22 foot minimum width.

Non-residential driveways that are unpaved shall have a minimum 20 foot paved surface strip measured from the back of the driveway apron.

Driveways without islands shall be a minimum of 24 feet wide for two way operation. Non-residential driveways with islands shall have a 16 foot entrance lane. A 16 foot exit lane shall be required when one exit lane is used, and a 24 foot exit shall be used for 2 exit lanes.

The number of street and driveway connections permitted serving a single property frontage or commercial development shall be the minimum deemed necessary by the Town for reasonable service to the property without undue impairment of safety, convenience, and utility of the roadway. Normally, not more than two driveways shall be permitted for any single property frontage.

The arrangement of driveways should be related to adjacent driveways and nearby street intersections. Driveways close to street intersections shall be

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at least 25 feet from the point of tangency of the radius curvature of the intersecting street. All driveways serving high volume generators shall be located a minimum of 200 feet from the intersection of public roads unless otherwise approved by the Town.

Where two driveways are proposed along a single property frontage to facilitate operations, the minimum recommended distance between the centerlines of the drives shall be 100 feet. The minimum distance between the centerlines of driveways into shopping centers and other high volume generators shall be a minimum of 400 feet.

Driveways (Residential)

Residential drives shall be 12 to 14 feet wide and shall conform to Standard Detail 3.15 for concrete driveway aprons.

Residential drives shall be located a minimum of 10 feet from the point of tangency of curb radii of street intersections.

Curb and Gutter

Curb and gutter shall be required on all streets except where specifically authorized otherwise by the Town Council.

Streets designed without curb and gutter must meet all of the following requirements and be approved by the Town Council:

- a. 50 foot right of way;
- b. 5% maximum vertical grade and 0.5% minimum grade;
- c. Adequate swale system to carry the 10 year storm in a non-erosive manner;
- d. Driveways across swales shall be constructed to provide for the passage of the 10 year storm;
- e. All driveway pipes shall have flared end sections or headwalls on inlet and outlet ends of the pipe, unless otherwise approved by the Town Engineer.

All median curb shall be standard 1'6" mountable curb as shown in Standard Detail 3.11 Curb and gutter within parking lots may be 1'6", 2'0", or 2'6" standard curb and gutter. All other curb and gutter shall be a minimum of 2'0" curb and gutter. Where curb and gutter is used on a street section 35 feet and greater, ABC shall be required to extend beyond the curb and gutter in accordance with Standard Detail 3.10. No valley curb shall be used on public streets.

A minimum five (5) foot section of curb and gutter shall remain when removing curb for the installation of a driveway, street turnout or repair of curb and gutter. When less than five (5) feet of the curb remains, the curb shall be removed to the next joint.

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Parking Lots

Parking lots shall be designed to provide safe maneuverability of vehicles. A minimum parking stall dimension of 9' x 19' shall be provided for 90 degree stalls, 8.5' x 19' for angle stalls, and 9' x 22' for parallel stalls. Handicap parking spaces shall be a minimum dimension of 96 inches with a five (5) foot lane adjacent to the space properly marked with signage in accordance with the N. C. Building Code.

At locations where a sidewalk abuts a 19 foot deep parking bay, the sidewalk shall be a minimum width of six (6) feet. In parking lots where end islands are required Standard Detail 3.09 is recommended.

A minimum pavement structure consisting of 8 inches of ABC and 2 inches of 1-2 shall be used along the travel aisle on parking facilities for multi-family (excluding duplex and triplex development) and non-residential developments. Access drives for these facilities shall also meet this minimum pavement standard.

All minimum stall depths and module widths shall be measured to the face of curb when curb and gutter is used.

All paved parking facilities shall be striped in accordance with the MUTCD with four (4) inch white lines.

Aisle widths for parking lots shall meet the following minimum requirements:

<u>Parking Angle</u>	<u>Aisle Width in Feet</u>	
	<u>One-Way Traffic</u>	<u>Two-Way Traffic</u>
0-15 degree	11	24 (0degree only)
16-37 degree	12	-
38-57 degree	13	-
58-74 degree	18	-
75-90 degree	24	24

Sidewalks

Sidewalks shall be constructed within the street right of way in accordance with Town Standards and Town policy. Sidewalks shall be installed at the time of roadway construction or widening unless otherwise approved by the Town Council.

The Town Council may decide some streets which require sidewalk according to the above criteria actually have too little pedestrian traffic to make sidewalk beneficial. In these cases, the requirement for sidewalk may be waived.

All sidewalks shall be constructed in accordance with Standard Detail 3.16. The minimum thickness of a sidewalk shall be 4 inches. At locations where a driveway crosses a sidewalk a 6 inch depth is required. Sidewalks

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shall have a uniform slope toward the roadway of not less than 1/4 inch per foot nor greater than 1/2 inch per foot. The utility strip between the sidewalk and the back of curb shall not be less than 1/4 inch per foot nor greater than 1/2 inch per foot toward the roadway.

Sidewalks shall typically be a minimum distance of five (5) feet off of the back of curb with a minimum width of four (4) feet. This requirement may be varied upon the approval of the Town.

Where sidewalks intersect any section of curb and gutter, a wheelchair ramp in accordance with Standard Detail 3.17 shall be installed.

E. Pavement Design

A pavement design will be necessary for all collector streets and arterials in accordance with these specifications. The pavement design and traffic analysis shall be signed and sealed by a North Carolina Professional Engineer. Pavement design shall be based on subgrade conditions, a 20 year design life and projected traffic loading. Subgrade conditions shall be based upon corrected soaked CBR values at 0.1 inch penetration as per ASTM D1883. Soil samples used for these CBR tests shall be obtained at intervals not greater than 500 feet. Should a Professional Engineer with expertise in geotechnical engineering certify that the soil in question is of the same type with similar engineering properties this spacing may be increased to a 700 foot maximum spacing. Boring logs and scaled drawings designating boring locations with CBR tests and other pertinent data shall accompany the pavement design.

A pavement design shall also be required for all streets located within areas with Triassic soils. These areas are shown on Figure 3 which includes all areas located west of the line designated as A-A.

The pavement design for areas with Triassic soils shall use the soaked CBR value for the pavement design. Typically, a subdivision will require two (2) to three (3) soil samples as a part of the pavement design. Larger subdivisions, greater than 100 lots, may require additional soil samples at the discretion of the Town Engineer.

All streets maintained by the NCDOT must receive approval of the pavement design from the NCDOT prior to the placement of curb and gutter or pavement material.

The pavement thickness shall at no time be less than the design shown in the Standard Detail for the various street widths.

Approved pavement design methods include those as proposed by NCDOT, the 1986 AASHTO Guidelines and the 1981 Asphalt Institute MS 1 document.

The AASHTO method will require use of a terminal serviceability index of 2.0 for collectors and 2.5 for thoroughfares, $S_o = 0.49$ for flexible pavement or $S_o = 0.39$ for rigid pavements, and a reliability of 98

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percent for thoroughfares and a reliability of 95 percent for collectors.

Rigid pavement design shall follow either the 1986 AASHTO Method or the Portland Cement Association Method.

F. Pavement Markings

All collectors and arterials shall be marked in accordance with the latest revisions of the MUTCD— unless otherwise approved by the Town Engineer. This shall be noted on roadway and subdivision plans as a requirement of the Developer and shall be done prior to issuance of a Certificate of Occupancy for the development or final acceptance of the roadway by the Town of Smithfield. The pavement markings for all collector streets and thoroughfares shall be thermoplastic. These markings are to be applied in accordance with the manufacturer's instructions.

The pavement markings along arterials streets with four (4) or five (5) lanes or which are median—divided facilities shall be installed such that the outside lanes are thirteen (13) feet in width to accommodate bicycle traffic unless otherwise approved by the Town Engineer.

G. Roadway Widening

All roadway widening shall be in conformance with Standard Detail 3.18.

H. Bridge Design

All public or private bridges shall be designed to withstand HS-20 highway loading unless otherwise approved by the Town Engineer and shall be properly signed and sealed by a North Carolina Professional Engineer.

3.03 SIGHT DISTANCE

Sight distance shall mean the length of roadway visible to the driver traveling along the roadway or waiting to enter or cross the roadway.

Nothing shall be erected, placed, planted, or allowed to grow between a height of two and one-half feet and ten feet above the level of the center of the adjacent intersection within a triangular area as determined by the chart below in a manner which obstructs the view of motorists using any street or approach to any street intersection so as to constitute a traffic hazard or a condition dangerous to the public safety. The foregoing shall not apply to fire hydrants, public utility poles, street markers, governmental signs, and traffic control devices located within such triangular areas or to signalized intersections with stop/go phases on all approaches.

The Town shall insure that sight visibility adjacent to Town maintained streets is maintained. The Town will notify the N.C. Department of Transportation of sight distance obstructions located within the right of way of State maintained roadways. The Town shall notify property owners of sight obstructions which exist on private property. The property owner shall be responsible for the removal of the obstruction on their property and shall be solely liable for any and all consequences resulting from their failure to remove the obstruction.

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SIGHT VISIBILITY MATRIX				
CONTROL DEVICE	THROUGH STREET SPEED LIMIT			
	LESS THAN 25 MPH	25--35 MPH	35--45 MPH	ABOVE 45 MPH
STOP SIGN	15' X 60'	15' X 70'	15' X 80'	15' X 90'
YIELD SIGN	25' X 60'	25' X 70'	30' X 80'	35' X 90'

NOTES:

The lesser length is measured along the curb line or pavement edge of the controlled approach; the greater length is measured along the curb line or pavement edge of the through street or non-controlled approach.

A 10' X 60' triangle shall be maintained for four way stop intersections on all approaches.

The Town shall review all proposed development plans, including site, subdivision, landscape plans, infrastructure plans and sign plans for compliance with these requirements. All new development within the Town's extraterritorial zoning jurisdiction shall meet these requirements as a part of the plan approval process.

It is recognized that in some cases conditions may exist that prevent the attainment of desirable sight distance due to social, economic or environmental consideration. In such cases, the maximum practical sight distance, up to the desirable values, shall be obtained. In addition, where desirable sight distance is not attained, additional measures, such as warning signs, reduced speed zones and other traffic controls may be imposed.

3.04 MATERIALS

Portland cement concrete for curb and gutter, driveways, and sidewalks shall have a minimum 28 day compressive strength of 3000 psi, a non-vibrated slump between 2.5 and 4 inches, a minimum cement content of 564 pounds per cubic yards, an air entrainment of 5-7 %, and a maximum water-cement ratio of 0.532.

Joint filler shall be a non-extruding joint material conforming to ASTM C1751.

Concrete Curing Agents shall be free from any impurities which may be detrimental to the concrete and meet Section 926 of NCDOT Standard Specifications for Roads and Structures.

Aggregate for portland cement concrete shall meet the requirements for fine and course aggregate of Section 1014 of the NCDOT Standard Specifications for Roads and Structures.

Portland Cement and admixtures shall meet the requirements of Section 1000 of

	
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the NCDOT Standard Specifications for Roads and Structures.

Water for mixing or curing the concrete shall be free from injurious amounts of oil, salt acid, or other products injurious to the finished product.

Aggregate Base Course shall consist of an approved coarse aggregate produced in accordance with the requirements indicated in Section 910 for either Type A, B, or C aggregate as described in the NCDOT Standard Specifications for Roads and Structures.

Bituminous Surface Course, Type I-1 and I-2, shall consist of a mixture of coarse and fine aggregates, asphalt cement, and shall meet the requirements in Section 645 of the NCDOT Standard Specifications for Roads and Structures.

Bituminous Concrete Base Course, Type HB, shall conform to the general, material, and construction specifications as specified in Section 610 and Section 630 of NCDOT Standard Specifications for Roads and Structures.

Bituminous Concrete Binder Course, Type H, shall conform to the general, material, and construction specifications as specified in Section 610 and Section 640 of NCDOT Standard Specifications for Roads and Structures.

Tack Coat shall be asphalt or asphalt cement and shall meet the general, material, and construction specifications as specified in Section 605 of NCDOT Standard Specifications for Roads and Structures.

Concrete Pavement shall meet Section 700 of NCDOT Standard Specifications for Roads and Structures.

Concrete Pavers may be used on privately maintained streets in accordance with Standard Detail 3.04. The Town of Smithfield will not maintain decorative type paved street surfaces such as pavers or imprinted designs within public right of way.


Geotextile Fabric may be used to stabilize a roadway, subgrades, slopes, and for other uses as necessary. At least one week prior to using this fabric, a sample and its associated engineering data shall be submitted to the Town Engineer for approval. Areas stabilized with fabric shall be indicated on "as-built" drawings with the manufacturer name and type fabric indicated.

3.05 CONSTRUCTION AND INSPECTION

No construction shall be conducted until the following applicable items have been obtained: all grading permits, NCDOT Encroachment Contracts, performance bonds, and Town of Smithfield subdivision and/or site plan approval.

A. Streets

No base material shall be placed on a roadway until the storm sewer, subgrade, utilities, and all appurtenances have been inspected and meet Town of Smithfield Standard Specifications.

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The Inspector may require field density testing of the subgrade soils from a certified soils laboratory. The soils laboratory shall perform sufficient Proctors to evaluate the compaction characteristics of various soils used in the roadbed. The Inspector may also require field density testing of the ABC used and an asphalt mix formula before either is inspected or approved.

The subgrade shall be compacted as described in Section 2.05 Earthwork. Inspection of the subgrade prior to placement of base course, and inspection of the base course prior to placement of asphalt shall be performed by proofrolling and/or field density testing at the direction of the Inspector.

B. Curb and Gutter, Driveways, and Sidewalks

No concrete shall be placed until the forms and subgrades have been approved by the Inspector. The surface of sidewalks shall be finished to grade and cross section with a float, troweled smooth and finished with a broom.

Subgrade shall be excavated to the required depth, and shaped to the proper cross-section. Where tree roots are encountered, they shall be removed to a depth of 1 foot for the full width of the excavation. The subgrade shall be stable and thoroughly compacted.

Forms shall be set and maintained true to the required lines, grades, and dimensions. Forms shall be constructed with material of such strength and rigidity to prevent any appreciable deflection between supports. Straight forms shall be within a tolerance of 1/2 inch in 10 feet from a true line horizontally or vertically. Forms shall be thoroughly cleaned of all dirt, mortar and foreign material before being used. All inside form surfaces shall be thoroughly coated with commercial quality form oil.

Grooved Contraction Joints shall be cut to a depth equal to at least 1/3 of the total slab thickness. The joint shall be no less than 1/8 inch in width and cut at intervals equal to the width of the sidewalk. A 1/2 inch expansion joint filled with joint filler shall be placed between all rigid objects and placed no farther than 50 feet apart for sidewalks and curb and gutter, extending the full depth of the concrete with top of the filler 1/2 inch below the finished surface.

3.06 FIRE LANES

Fire Lanes shall be installed and inspected in accordance with the public street requirements of Section 3.05 A and 3.05 B. The general requirement designates that any building located more than 150 feet from a public road or which exceeds 30 feet in height and is set back more than 50 feet from a public road shall have a fire lane.

Fire lanes shall be a minimum width of 20 feet and shall be properly marked and signed to designate the access as a "fire lane" as specified by the Fire Official. The surface of the fire lane shall be paved with a minimum of 8

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inches of ABC stone and 2 inches of 1-2 asphalt.

All fire lanes shall be marked in accordance with one of the following requirements:

- (1) Continuously painted yellow striping along the fire lane with "No Parking Fire Lane" printed with minimum eight (8) inch high letters at forty (40) foot intervals or as directed by the Fire Official;
- (2) Continuously painted yellow curb with "No Parking - Fire Lane" along the fire lane with "No Parking - Fire Lane" printed with minimum eight (8) inch high letters at forty (40) foot intervals or as directed by the Fire Official;
- (3) The installation of the MUTCD standard sign showing "No Parking - Fire Lane" placed at each end of the fire lane and at fifty (50) foot intervals with arrows on the signs or a continuously painted yellow strip along the designated fire lane.

3.07 TRAFFIC CONTROL AND STREET NAME SIGNS

Traffic Control and Street Name Signs within subdivisions which will be maintained by the Town of Smithfield shall be consistent with the MUTCD.

3.08 TRAFFIC CONTROL DEVICES

The Town will not allow the obstruction of any public street, private street or fire lane unless otherwise stipulated by the Town Council. This requirement is in accordance with the 1992 edition of the North Carolina State Fire Prevention Code. The reference to an "obstruction" shall include parking, speed bumps or any other device which may obstruct the free passage of emergency vehicles.

All traffic control devices must be shown and approved as a part of a site plan prior to installation and must be in conformance with the Town Standard Specifications. The traffic control devices and all related signs and pavement markings shall be maintained by the Owner as a part of the approval of the plan. Traffic control devices shall include rumble strips, raised pavement markers, pavement undulations (speed humps) or speed bumps.

Rumble Strip

An irregular surface established to draw the attention of motorists and alert them of potential hazards or conflicts. The material used as a part of a rumble strip may be cobblestone, stamped concrete, brick or rough surface asphalt.

A rumble strip may not vary more than one (1) inch in height from the pavement elevation of the adjacent travelway. All rumble strips must be located outside any public right of way.

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Raised Pavement Markers

Raised pavement markers may be used to create an irregular surface to draw the attention of motorists and to alert them of potential hazards or conflicts. The markers must be made of a flexible and durable solid material designed to support vehicular traffic. The placement of markers may be staggered in a manner as approved by the Engineering Department.

All raised pavement markers shall have a maximum height of one (1) inch above the pavement surface. The minimum size of the marker shall be four (4) inches by four (4) inches. The markers must be located outside any public right of way. All raised pavement markers shall have cube-corner microprism reflectors visible from either direction of travel.

Pavement Undulation (Speed Hump)

A pavement undulation is a gradual raised pavement surface which extends transversely across the travelway. The surface material for a pavement undulation shall be the same as the adjacent travelway, typically asphalt.

A pavement undulation shall be parabolic with a maximum height of three (3) inches. The pavement shall be tapered to the edge of the pavement or gutter line for the last twelve (12) inches along each side. The minimum length of the pavement undulation shall be twelve (12) feet.

All pavement undulations shall be clearly marked with pavement markings or warning signs for each direction of travel. The markings shall consist of letters stenciled on the pavement surface in reflective white paint designating "BUMP" with a minimum letter height of five (5) feet. The pavement markings shall be installed for each direction of travel. These markings shall be installed a minimum of twenty-five (25) feet from the pavement undulation. Also, the length of the pavement undulation shall have twelve (12) inch stripes in the direction of travel in reflective white paint spaced at a distance of six (6) feet on center.

All pavement undulations must be located outside any public right of way and may not be used on any public or private street, access, travelway, etc. designated as a fire lane. Pavement undulations must be located a minimum distance of 500 feet from a signalized intersection. The Town and/or N. C. Department of Transportation may require the removal of any speed undulation which causes traffic to back up onto a public street.

Speed Bump

A speed bump is an abrupt raised area in the pavement surface extending transversely across the travelway. The surface material for a speed bump shall be asphalt or the same material as the travelway.

The maximum height of a speed bump shall be three (3) inches. The minimum width of a speed bump shall be three (3) feet.

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All speed bumps shall be clearly marked with pavement markings or warning signs for each direction of travel. The markings shall consist of letters stenciled on the pavement surface in reflective white paint designating "BUMP" with a minimum letter height of five (5) feet. The pavement markings shall be installed for each direction of travel. These markings shall be installed a minimum of twenty-five (25) feet from the undulation. Also, the speed bump shall have twelve (12) inch stripes in the direction of travel in reflective white paint spaced at a distance of six (6) feet on center.


All speed bumps must be located outside any public right of way and may not be used on any public or private street, access, travelway, etc. designated as a fire lane. Speed bumps must be located a minimum distance of 500 feet from a signalized intersection. The Town and/or N. C. Department of Transportation may require the removal of any speed bump which causes traffic to back up onto a public street.

Pedestrian Crossings

All locations which are designated for pedestrian traffic crossings shall be designated as a crosswalk with pavement marking and signage in accordance with MUTCD.

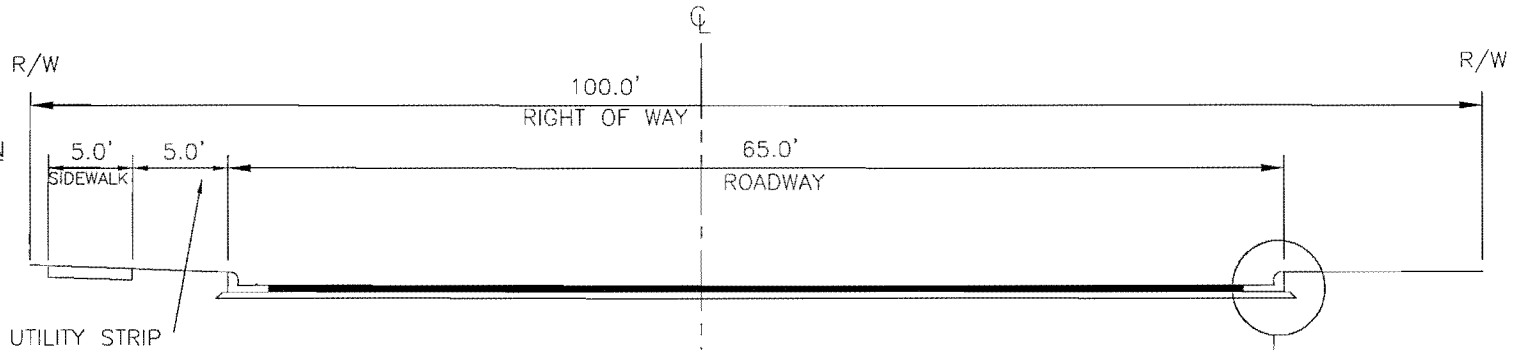
All pedestrian crossings must be approved by the Town prior to installation.

END OF SECTION 3.00

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PAVEMENT DESIGN

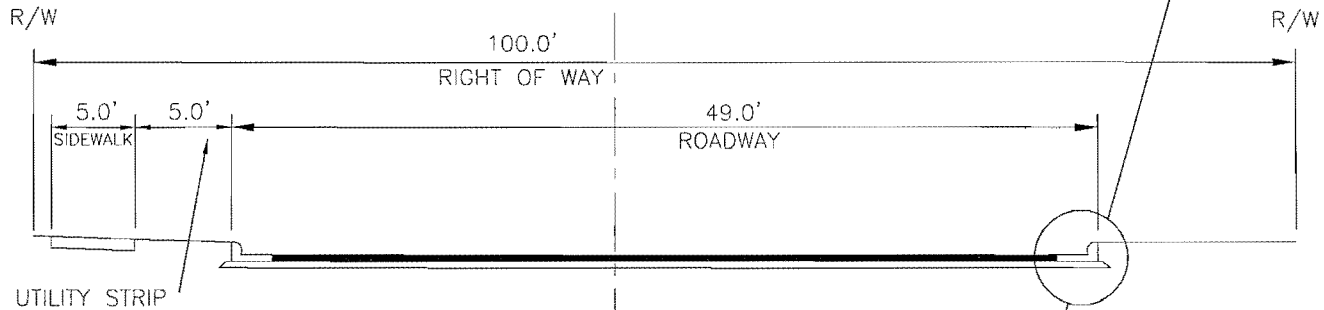
1 1/2" I-2
2" TYPE H
8" A.B.C.



100' RIGHT OF WAY
65' ROADWAY SECTION

PAVEMENT DESIGN

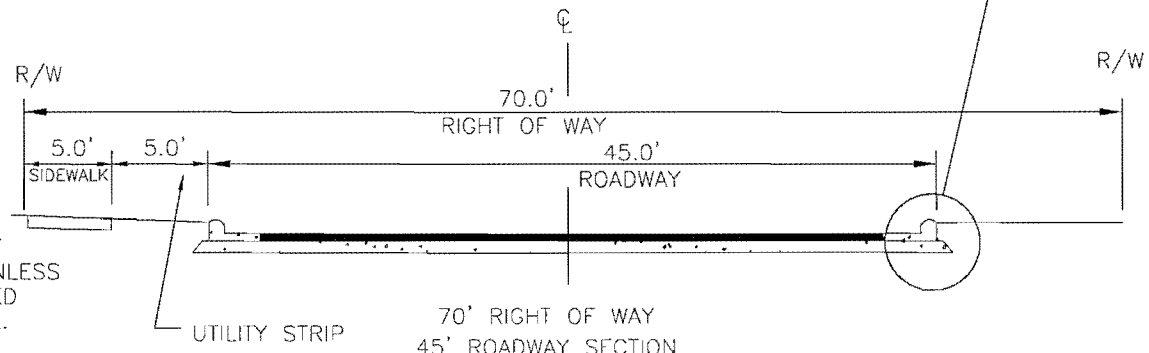
2 1/2" I-2
8" A.B.C.



100' RIGHT OF WAY
49' ROADWAY SECTION

PAVEMENT DESIGN

2 1/2" I-2
8" A.B.C.



70' RIGHT OF WAY
45' ROADWAY SECTION

NOTES:

NORMAL CROWN OF
1/4" PER FOOT UNLESS
OTHERWISE DIRECTED
BY TOWN ENGINEER.

PAVEMENT DESIGN SHALL
BE AS SHOWN UNLESS
OTHERWISE APPROVED
BY THE TOWN

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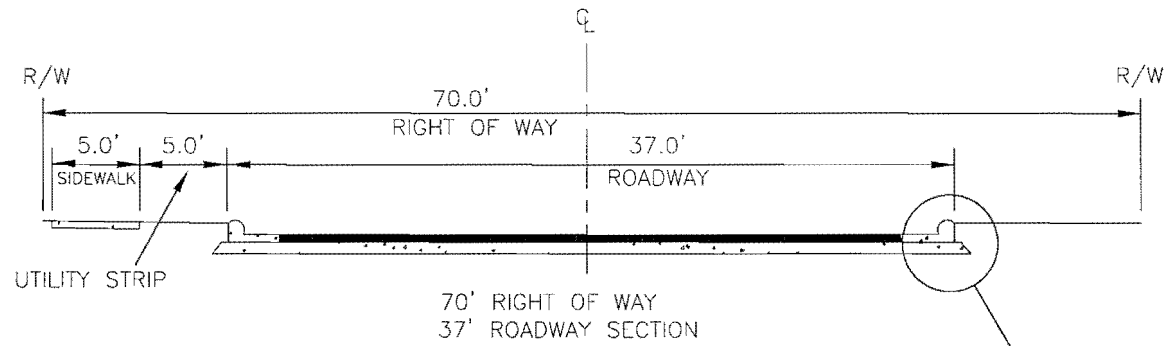
Standard Street
Sections

Drawing
0301

Date
1/10/2000

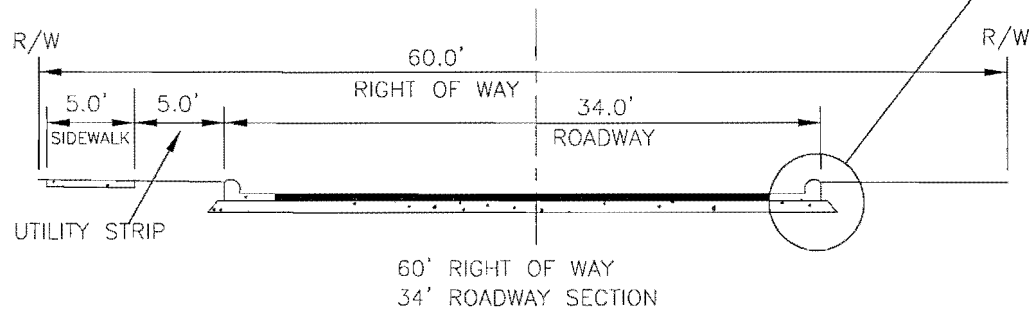
PAVEMENT DESIGN

2 1/2" I-2
8" A.B.C.



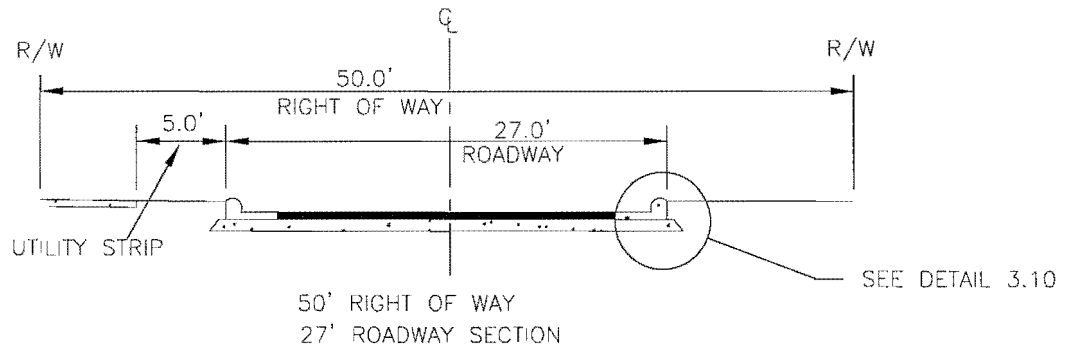
PAVEMENT DESIGN

2" I-2
8" A.B.C.



PAVEMENT DESIGN

2" I-2
8" A.B.C.



NOTES:

PAVEMENT DESIGN SHALL
BE AS SHOWN UNLESS OTHERWISE
APPROVED BY THE TOWN

NORMAL CROWN OF 1/4" PER
FOOT UNLESS OTHERWISE DIRECTED
TOWN ENGINEER

SMITHFIELD
NORTH CAROLINA

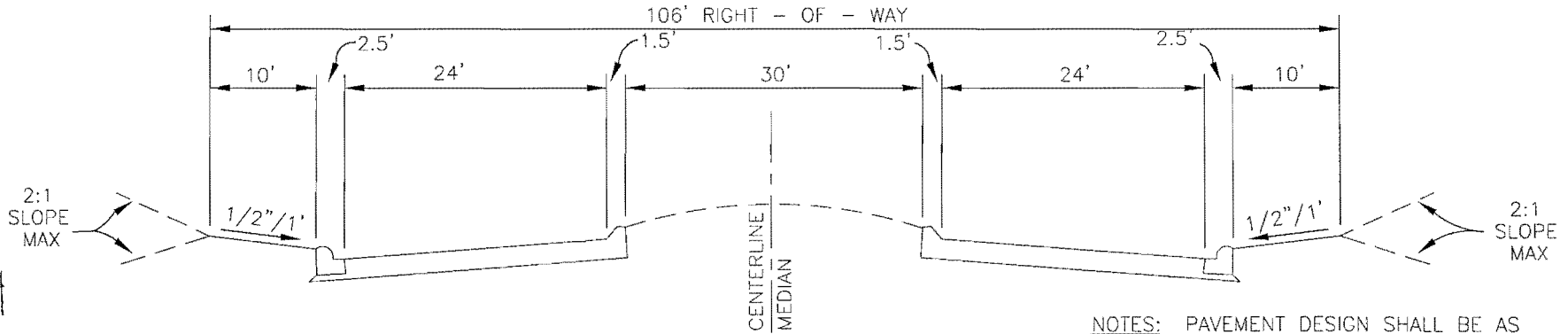


STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Drawing
0302

Slondard Street
Sections

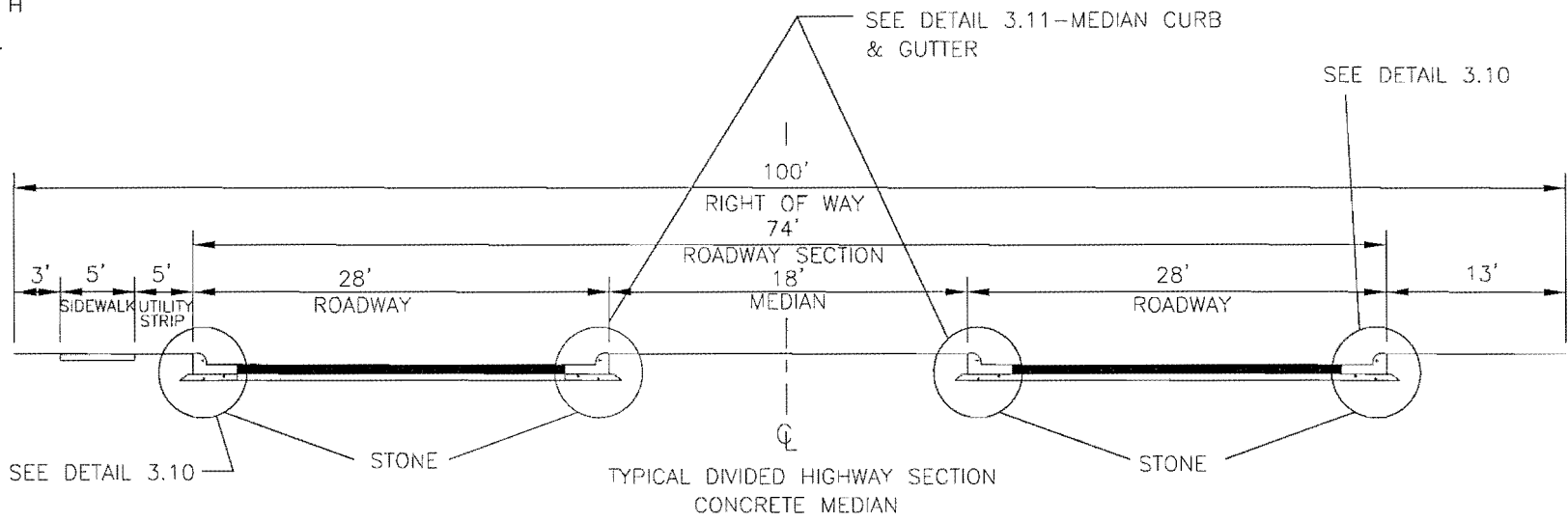
Date
1/10/2000



TYPICAL DIVIDED HIGHWAY SECTION
LANDSCAPE MEDIAN

NOTES: PAVEMENT DESIGN SHALL BE AS CALCULATED ACCORDING TO SECTION 3.02 E.


PAVEMENT DESIGN
 1 1/2" I-2
 2" TYPE H
 8" A.B.C.



TYPICAL DIVIDED HIGHWAY SECTION
CONCRETE MEDIAN

NOTES: NORMAL CROWN OF 1/4" PER FOOT UNLESS OTHERWISE DIRECTED BY TOWN ENGINEER.

NOTES: PAVEMENT DESIGN SHALL BE AS SHOWN OR AS CALCULATED ACCORDING TO SECTION 3.02 E, WHICHEVER IS GREATER.

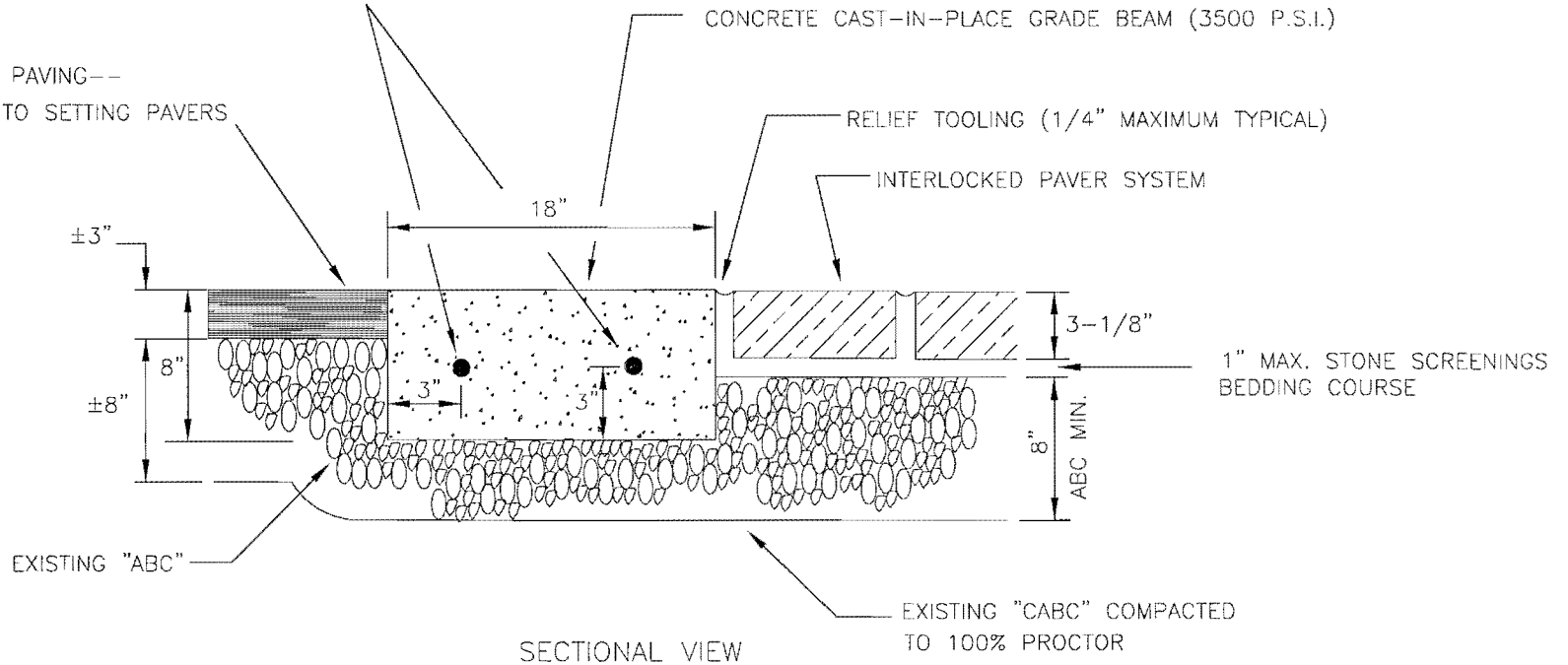
Standard Street Sections	STANDARD DETAIL AND SPECIFICATIONS MANUAL	SMITHFIELD NORTH CAROLINA	
Date	1/10/2000		

NOTES:


1. EXISTING "CABC" IN ROADWAY MAY BE USED AS BASE COURSE AFTER COMPACTING TO ACHIEVE 100% PROCTOR. LOCALIZED UNDERCUTTING AND REPAIR SHALL BE REQUIRED WHERE PROOFROLLING RESULTS IN PUMPING OR AS DIRECTED BY THE TOWN. TESTING OF SUBGRADE/"CABC" COMPACTION SHALL BE REQUIRED.
2. EXISTING ROADWAY PAVING SHALL BE SAW-CUT TO RECEIVE PLACEMENT OF GRADE BEAMS. A THREE-DAY CURING PERIOD SHALL BE REQUIRED FOR GRADE BEAMS PRIOR TO REMOVAL OF REMAINING BITUMINOUS PAVING. BASE BELOW GRADE BEAMS SHALL BE COMPACTED TO 100% PROCTOR.
3. BRICK PAVED STREETS SHALL NOT BE MAINTAINED BY THE TOWN OF SMITHFIELD.

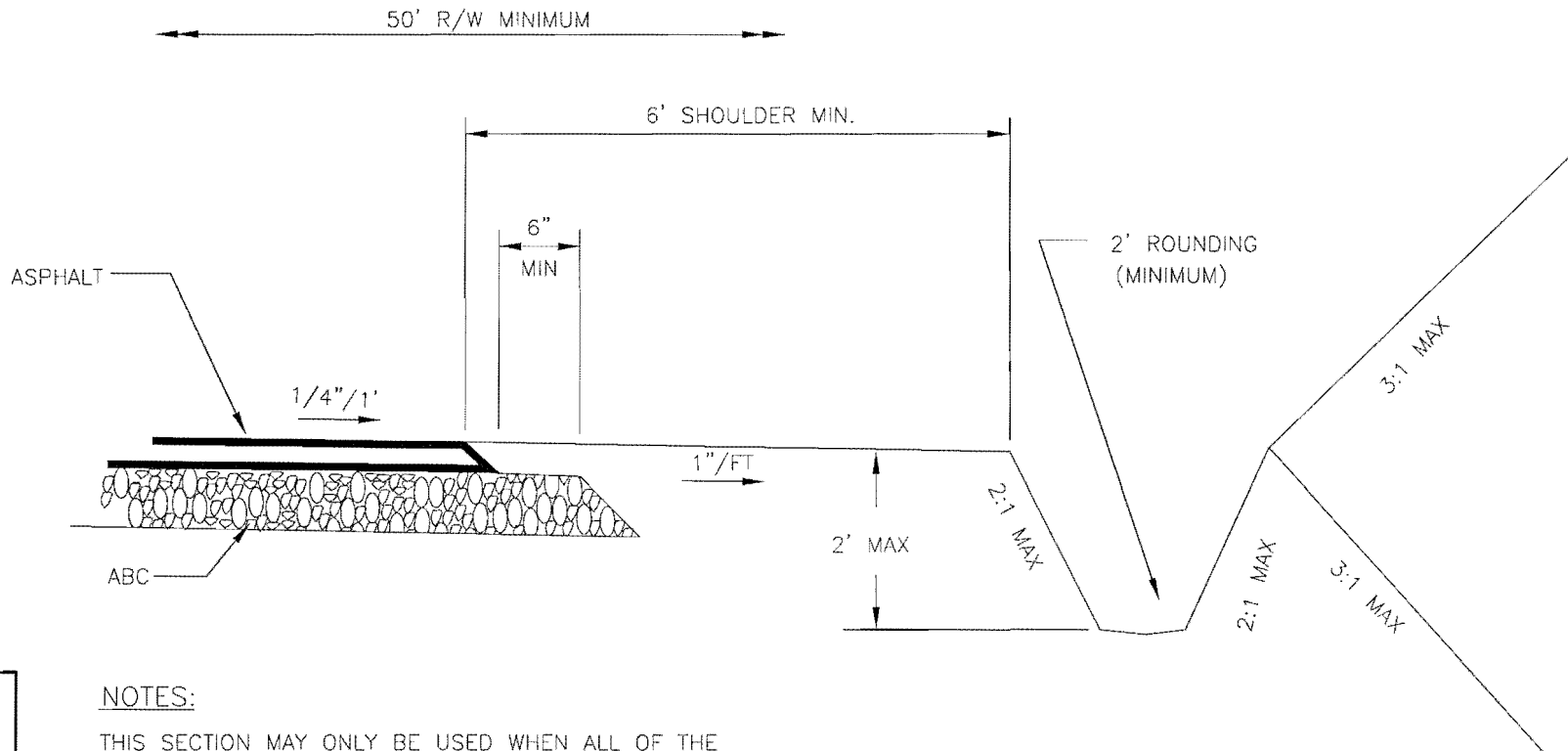
(2) No. 4 REBAR - CONTINUOUS

EXISTING "1-2" BIT. PAVING --
REPAIR CUT PRIOR TO SETTING PAVERS



Interlocked Concrete Paver Street Section	SMITHFIELD NORTH CAROLINA
	STANDARD DETAIL AND SPECIFICATIONS MANUAL
Date 1/10/2000	Drawing 0304





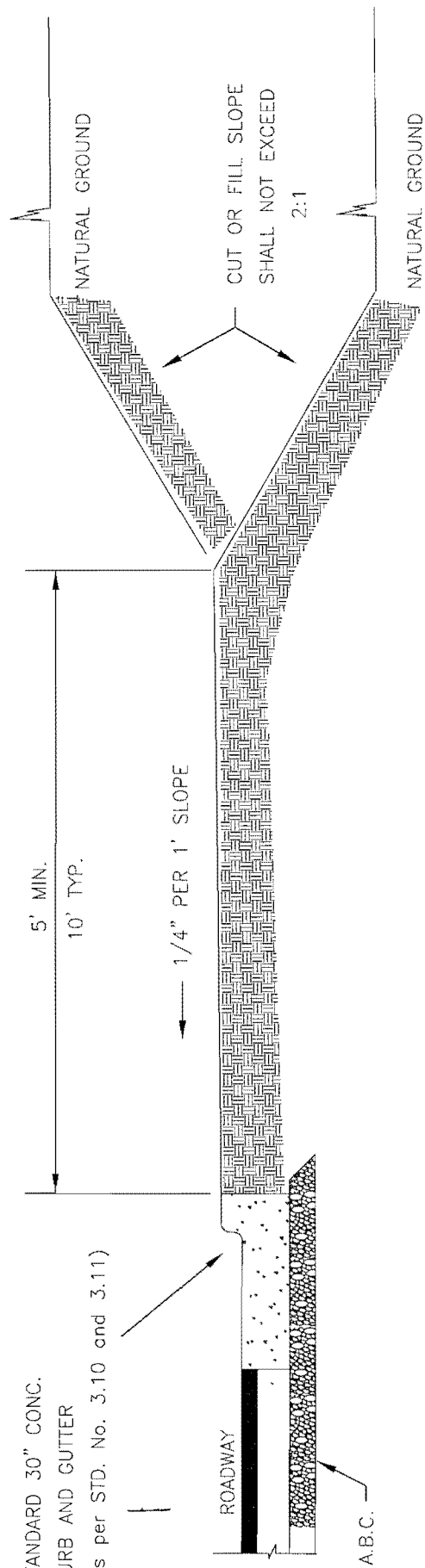
NOTES:

THIS SECTION MAY ONLY BE USED WHEN ALL OF THE FOLLOWING CONDITIONS ARE MET

1. STREET IS WITHIN A WATERSHED PROTECTION DISTRICT.
2. STREET DESIGNATED TO BE WITHOUT CURB AND GUTTER AS PER TOWN COUNCIL APPROVAL.
3. STREET VERTICAL GRADE SHALL NOT EXCEED 5% AT ANY POINT.
4. SWALE SYSTEM DESIGNED TO CARRY AT LEAST THE 10 YEAR STORM.
5. VELOCITY WITHIN THE SWALE BE NON-EROSIVE.
6. DETAILED DRAINAGE CALCULATIONS REQUIRED.

SMITHFIELD NORTH CAROLINA	STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing 0305
	Standard Section Without Curb & Gutter	Date 1/11/2000





NOTES:

THE TEN FOOT SHOULDER SHALL
 BE USED ON ALL STREETS WITH
 A CROSS SECTION OF 35 FEET
 AND GREATER.

SMITHFIELD
NORTH CAROLINA

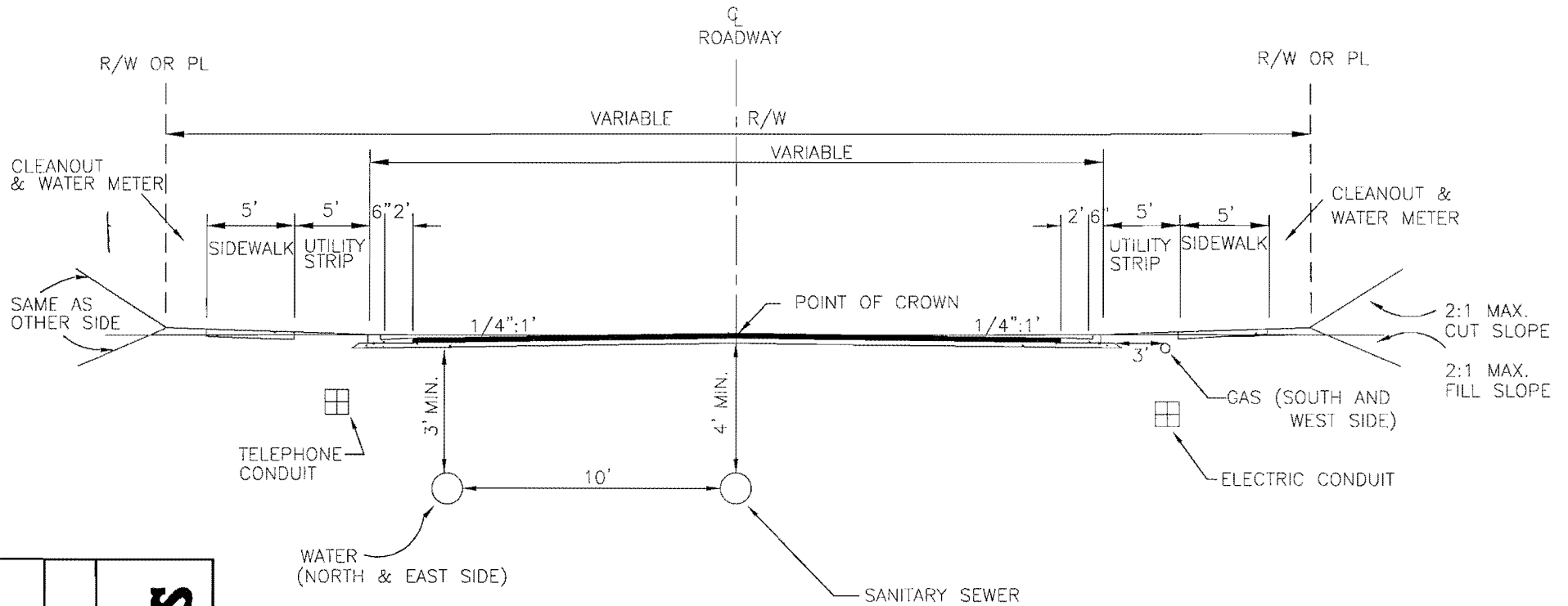


STANDARD DETAIL AND
 SPECIFICATIONS MANUAL

Drawing
 0306

Standard Shoulder
 Section Without Sidewalk

Date
 1/11/2000



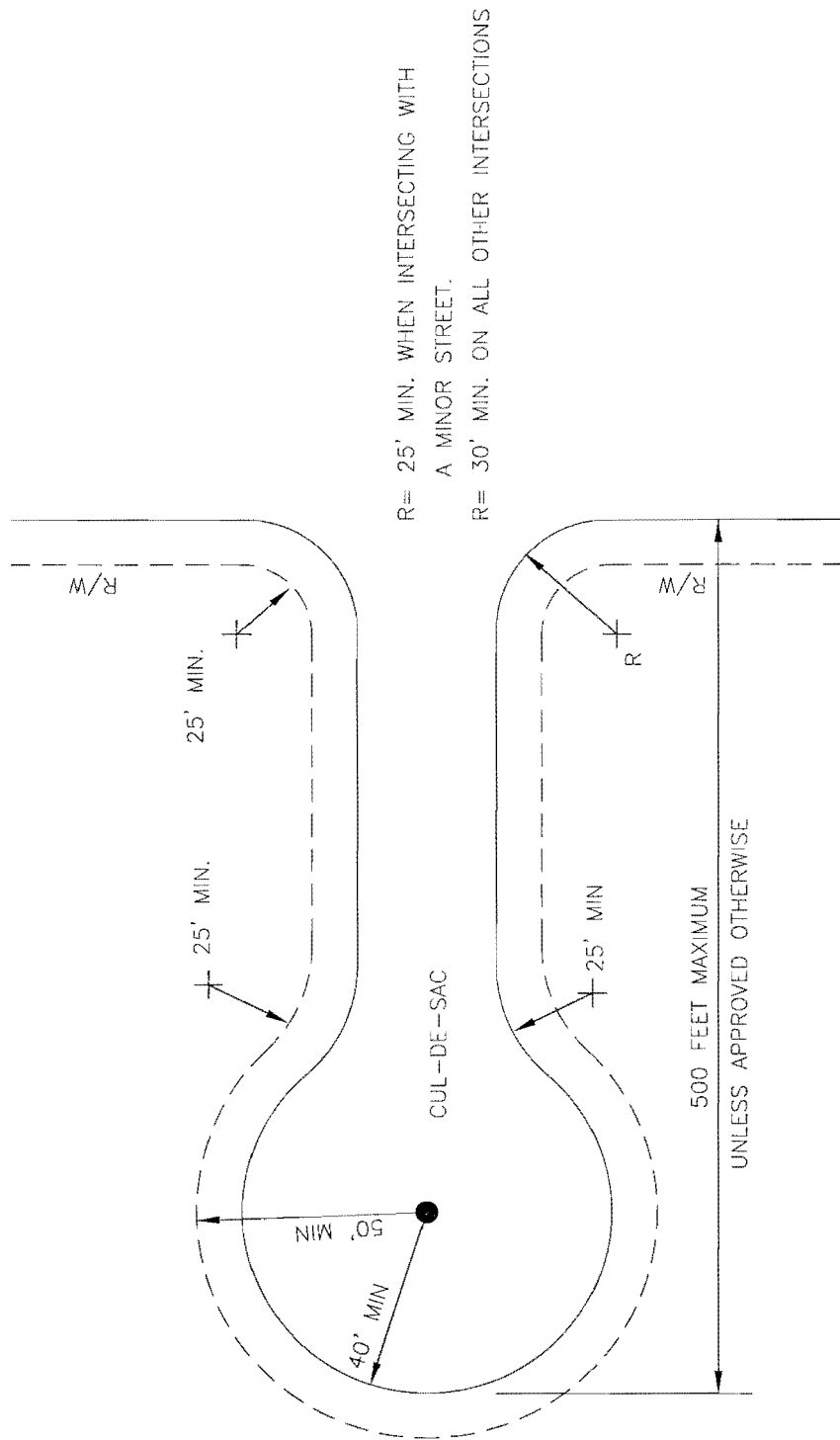
CROSS SECTION

NOTES:

THERE SHALL BE AN 18" VERTICAL SEPARATION BETWEEN WATER AND SEWER LINES

WATER AND/OR SANITARY SEWER LINES SHALL BE A MINIMUM OF TWO(2) FEET FROM THE EDGE OF THE CURB AND GUTTER.

Standard Street Cross Section Showing Utility Locations	SMITHFIELD NORTH CAROLINA	
	STANDARD DETAIL AND SPECIFICATIONS MANUAL	
	Date 1/11/2000	



R = 25' MIN. WHEN INTERSECTING WITH
A MINOR STREET.

R = 30' MIN. ON ALL OTHER INTERSECTIONS

SMITHFIELD NORTH CAROLINA

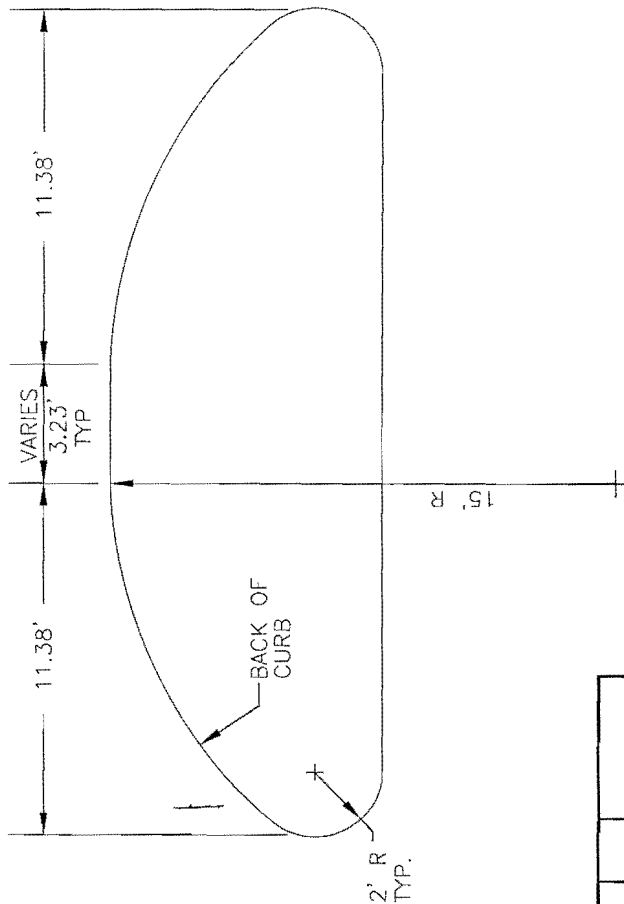
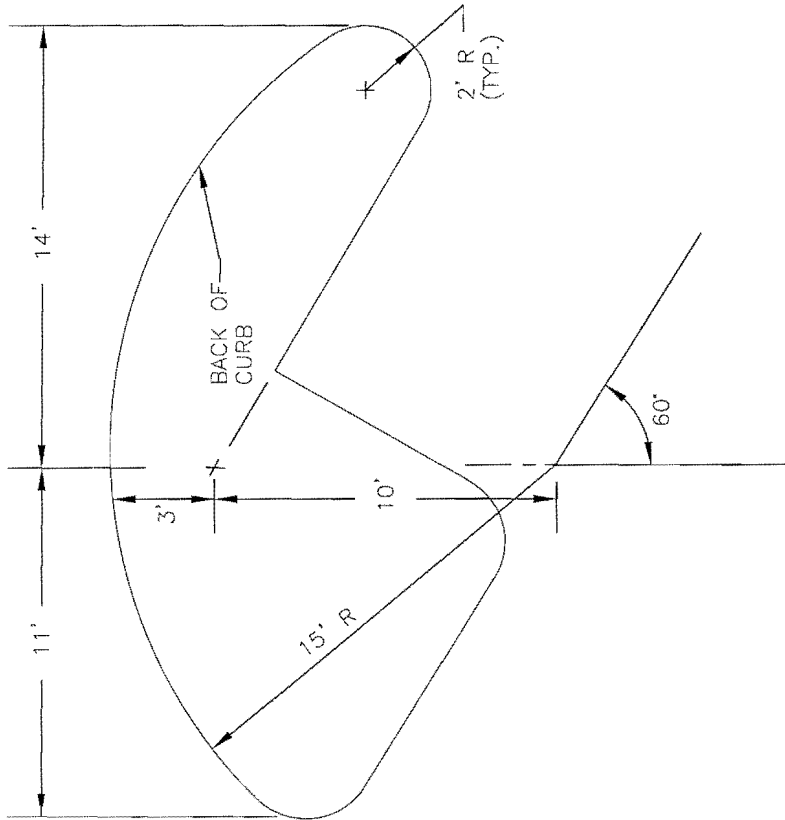


STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Drawing
0308

Cul-De-Sac Dimensions

Date
1/11/2000



**SMITHFIELD
NORTH CAROLINA**

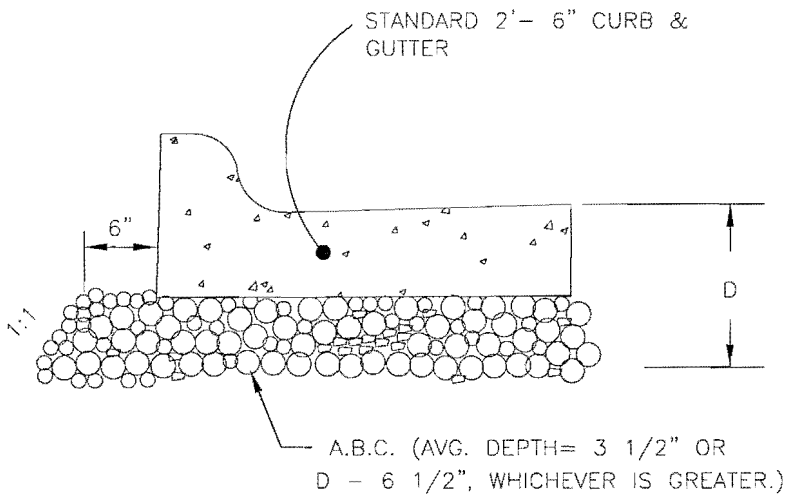


STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Drawing
0309

End islands For
Parking Lots

Date
1/11/2000



**SMITHFIELD
NORTH CAROLINA**

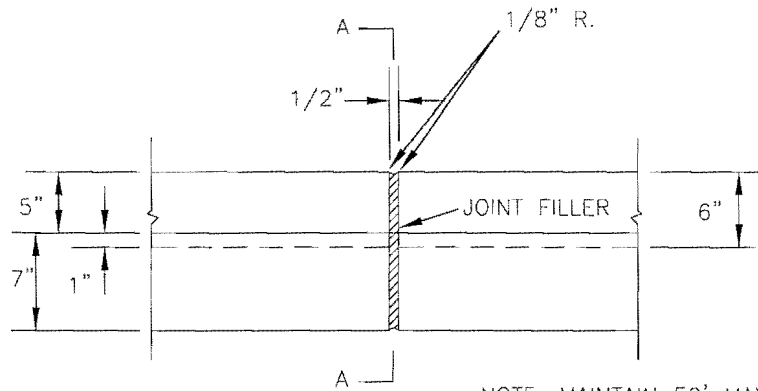


STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Drawing
0310

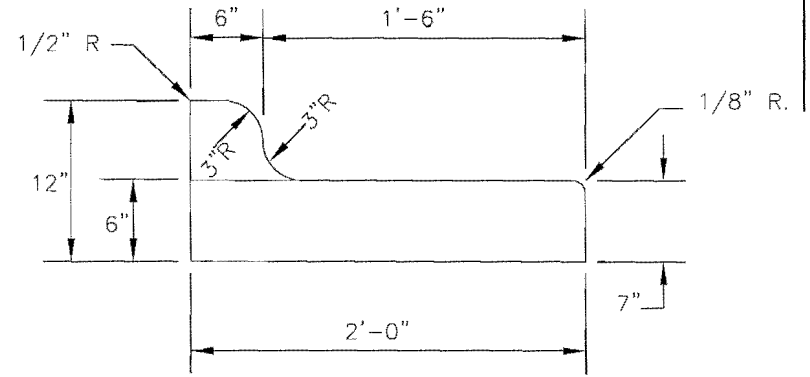
A.B.C. Under 2'-6"
Curb & Gutter

Date
1/11/2000



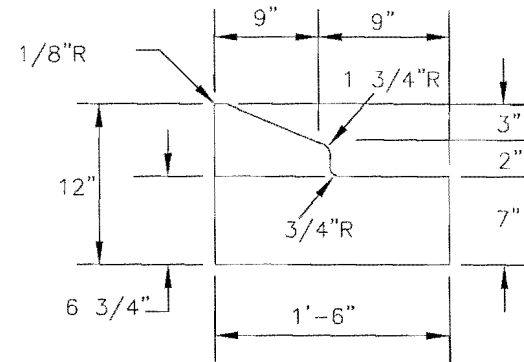
NOTE: MAINTAIN 50' MAX. BETWEEN JOINTS
OR AT ALL RIGID OBJECTS

FRONT ELEVATION
TRANSVERSE EXPANSION JOINT



SECTION A--A
SIDE ELEVATION

COMBINATION CURB AND GUTTER

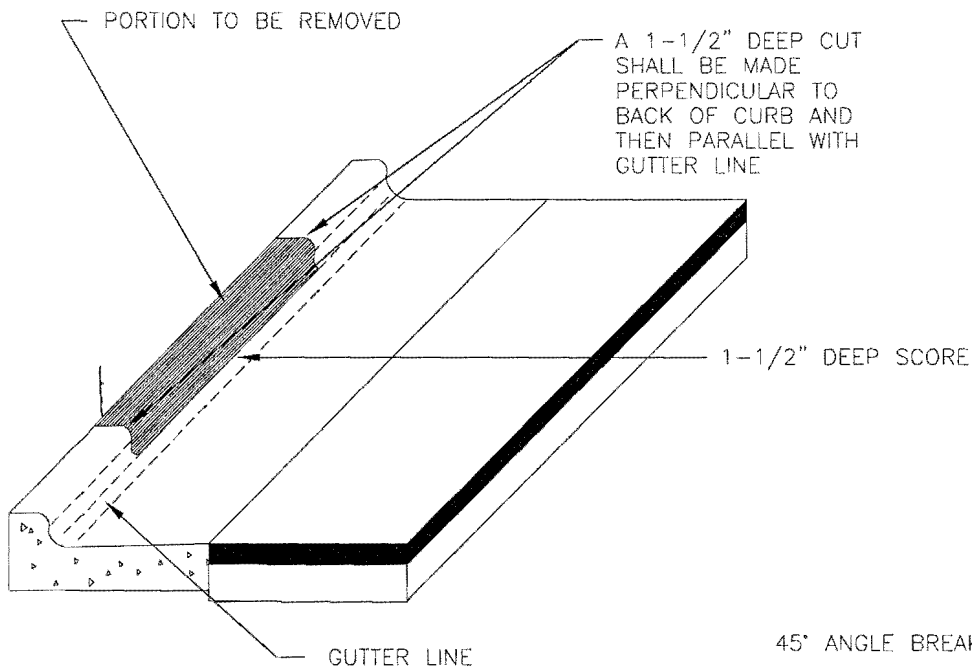


MEDIAN CURB AND GUTTER
SIDE ELEVATION

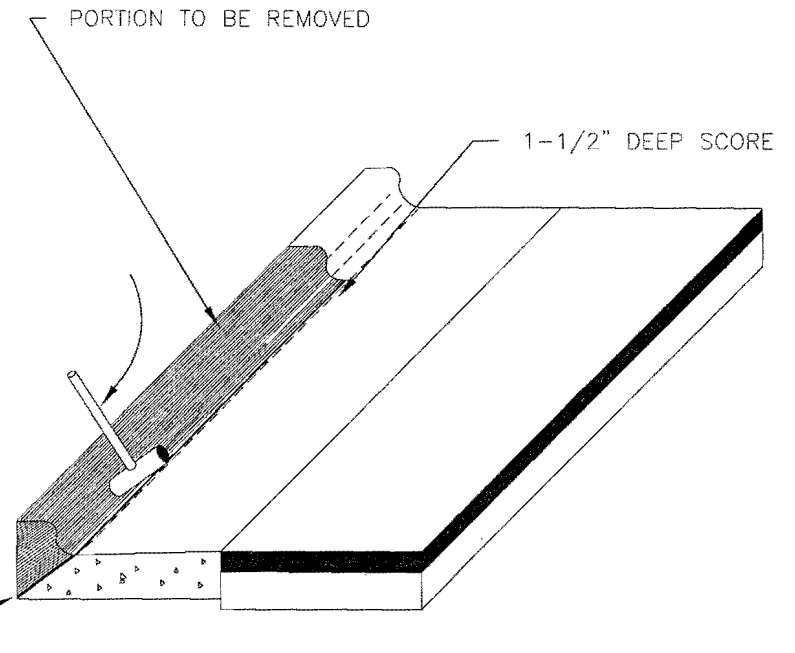
NOTES:

1. CONCRETE SHALL BE 3,000 P.S.I.
2. CONTRACTION JOINTS SHALL BE SPACED AT 10' INTERVALS.(A 15' SPACING WILL BE ALLOWED WHEN A MACHINE IS USED.)
3. FINISH ALL CONCRETE WITH CURING COMPOUND

Standard Concrete Curb and Gutter	STANDARD DETAIL AND SPECIFICATIONS MANUAL	SMITHFIELD NORTH CAROLINA	



STEP ONE




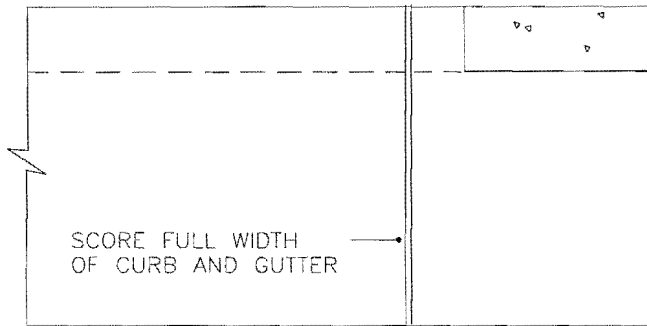
STEP TWO

NOTES:

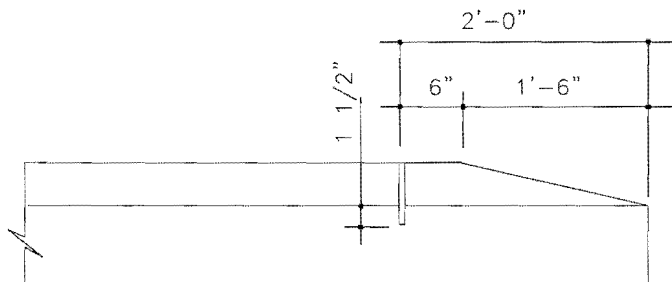
CURB AND GUTTER SECTION SHALL BE REMOVED IN ACCORDANCE WITH DRIVEWAY WIDTH APPROVED BY THE TOWN.

IF PERPENDICULAR CUT IS WITHIN 12" FROM A JOINT, THEN THE PARALLEL CUT SHALL BE MADE TO THAT JOINT.

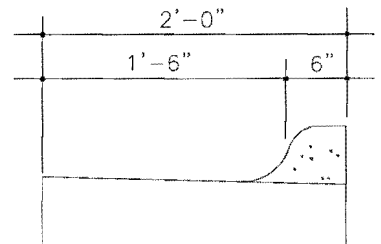
<p>SMITHFIELD NORTH CAROLINA</p> 	<p>STANDARD DETAIL AND SPECIFICATIONS MANUAL</p>	<p>Drawing 0312</p>
	<p>Standard Method of Removing Existing Curb (For a Driveway Apron Installation)</p>	<p>Date 1/11/2000</p>



PLAN



FRONT



END

**SMITHFIELD
NORTH CAROLINA**

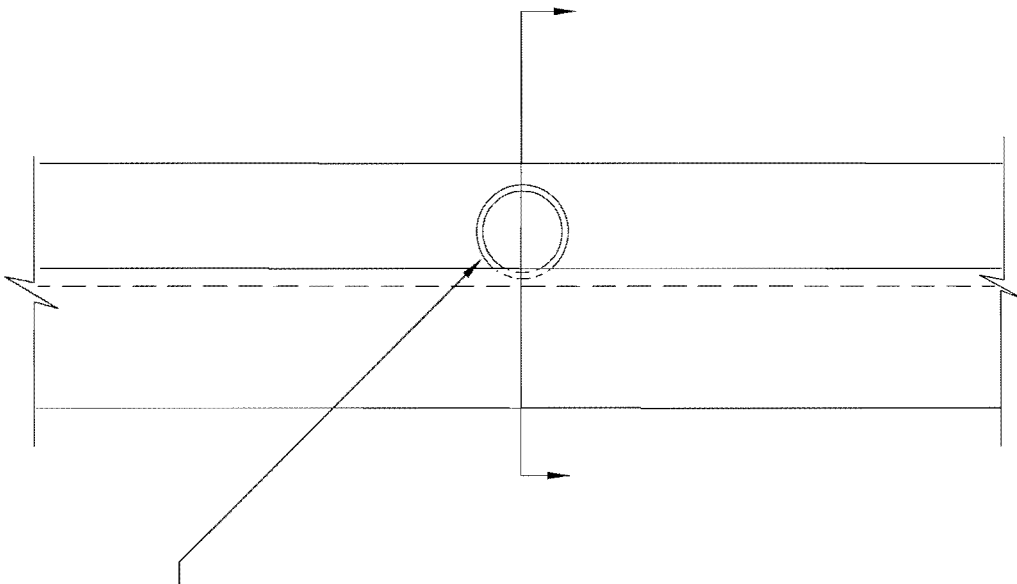


STANDARD DETAIL AND
SPECIFICATIONS MANUAL

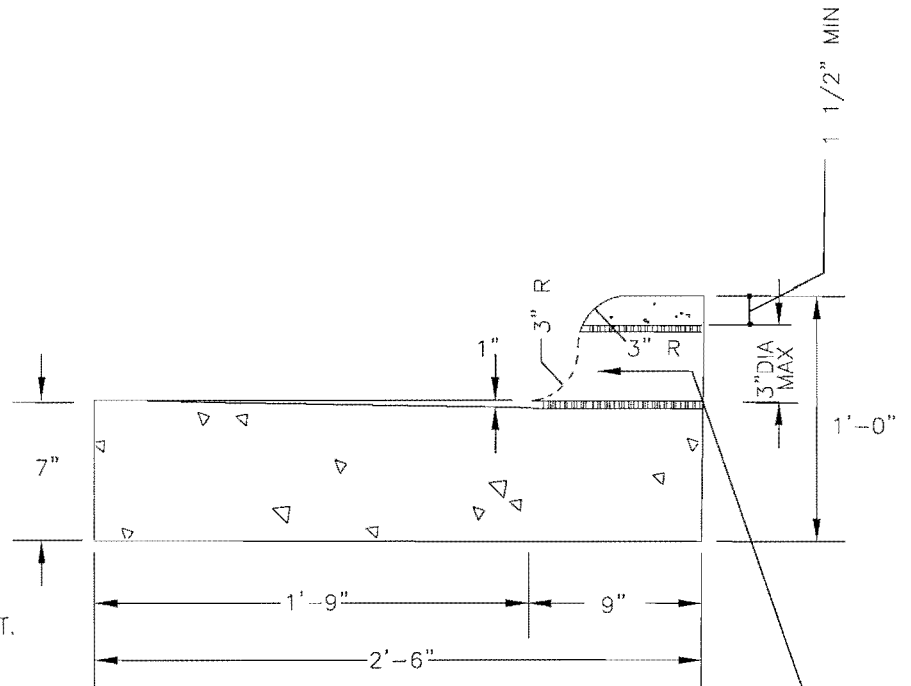
Drawing
0313

Standard Method of
Ending Curb and Gutter

Date
1/11/2000



THE EDGES OF DRAIN HOLE
MUST BE ROUNDED AND FINISHED
SMOOTH AT THE FACE OF THE CURB



SEE GENERAL NOTES FOR REQUIRED SLOPE

NOTES:

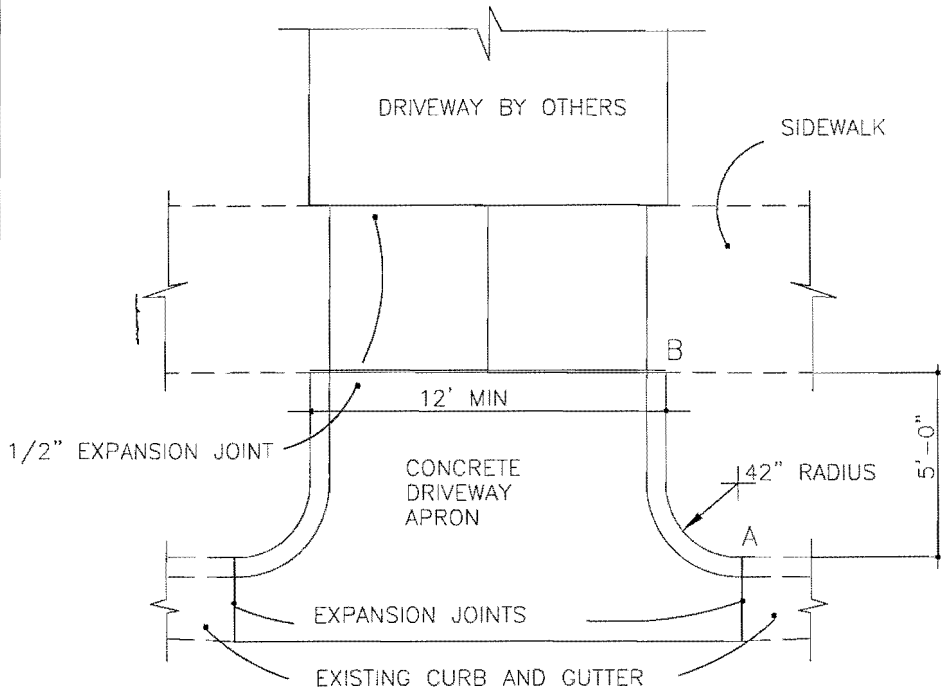
- CURB DRAINS SHALL NOT BE CONSTRUCTED 18" OF CONTRACTION OR EXPANSION JOINTS
- OPENING GRADE MAY VARY BETWEEN A MAXIMUM SLOPE OF 1/2" PER FT. AND A MINIMUM OF 1/4" PER FT.
- MORE THAN ONE HOLE MAY BE INSTALLED PROVIDED THE HOLES ARE LOCATED WITH 18" MINIMUM SPACING
- IN LIEU OF CUTTING THE CURB TO INSTALL A THREE (3) INCH PIPE, A FOUR (4) INCH CONCRETE BORE MAY BE USED

SMITHFIELD NORTH CAROLINA	
STANDARD DETAIL AND SPECIFICATIONS MANUAL	
Standard Curb and Drain	
Drawing 0314	Date 1/12/2000

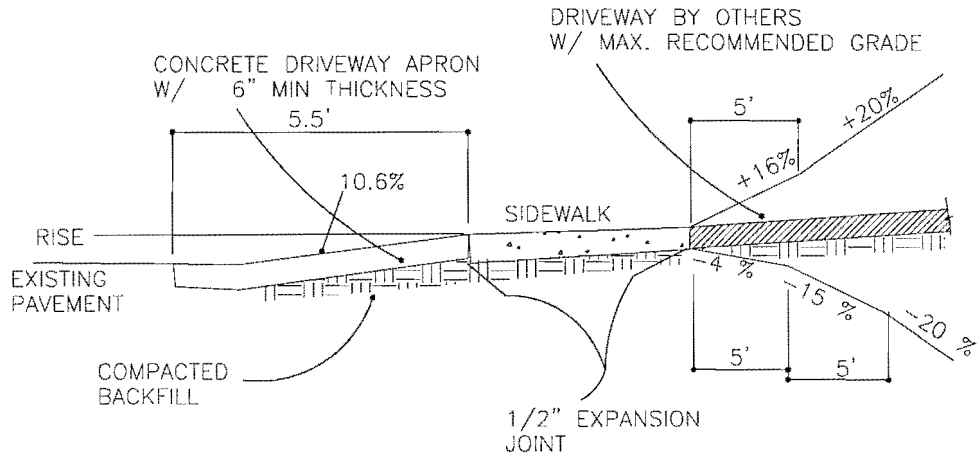


NOTE TO CONTRACTOR:

- RESIDENTIAL DRIVEWAY TO BE 12' TO 24' IN WIDTH
- COMMERCIAL AND INDUSTRIAL DRIVEWAY TO BE A MAXIMUM OF 36' WIDE
- ALL CONCRETE SHALL BE 3000 PSI
- ELEV. "B" MINUS ELEV "A" EQUALS 1 INCH



PLAN VIEW



TYPICAL SECTION

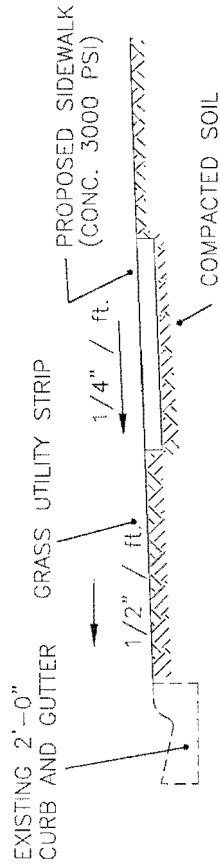
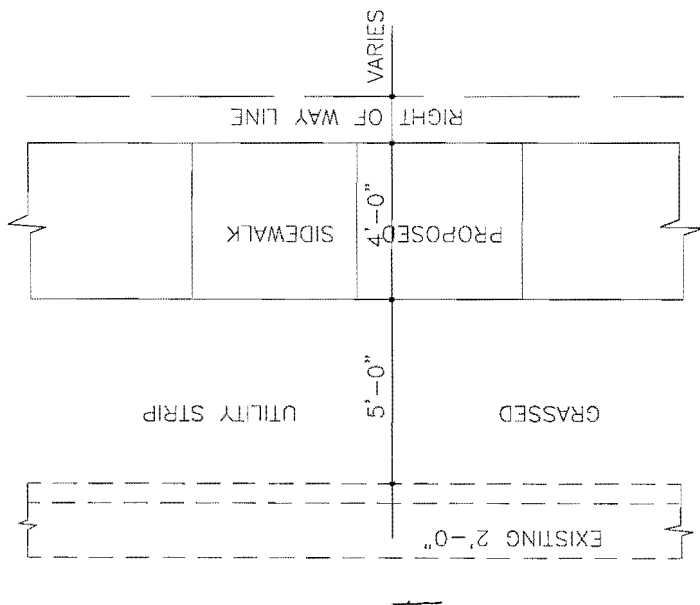
NOTES:

1. CURB SHALL BE TAPERED TO FINISH FLUSH WITH SIDEWALK.
2. BEGINNING RADIUS SHALL NOT ENCROACH ON ADJACENT PROPERTIES BASED ON A PROJECTION OF THE PROPERTY LINE FROM THE RIGHT OF WAY TO THE CURB LINE.
3. SIDEWALK SECTION SHALL NOT BE REQUIRED ALONG STREETS WHICH ARE NOT PLANNED FOR SIDEWALK.

SMITHFIELD NORTH CAROLINA	
STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing 0315
Standard Driveway Apron	Date 1/12/2000

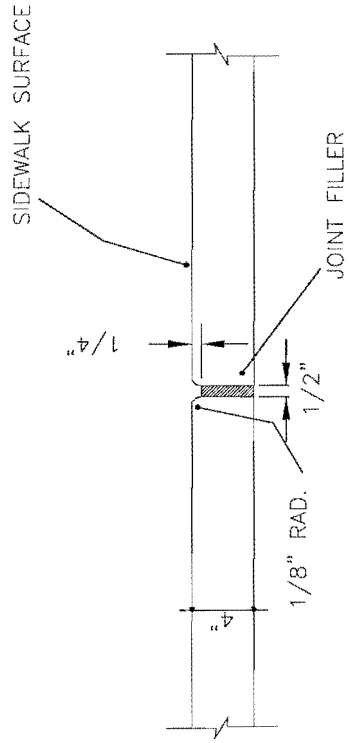
NOTES:

1. TRANSVERSE EXPANSION JOINT TO BE A MAX OF 50 FEET.
2. ALL CONCRETE TO BE FINISHED WITH CURING COMPOUND



TYPICAL SECTION

PLAN VIEW



TRANSVERSE EXPANSION JOINT

**SMITHFIELD
NORTH CAROLINA**

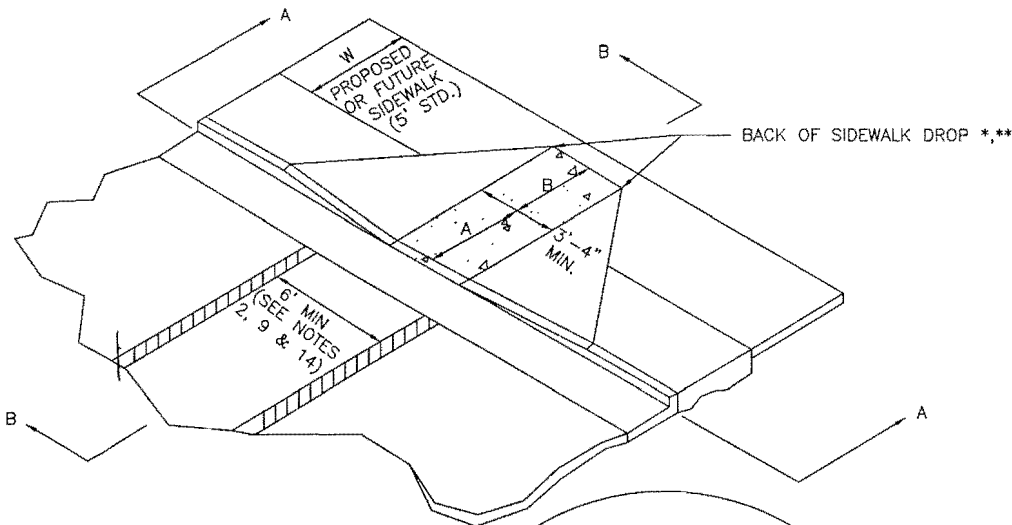


STANDARD DETAIL AND SPECIFICATIONS MANUAL

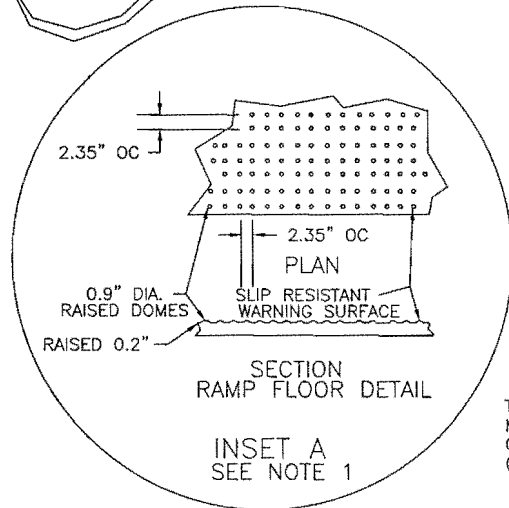
Drawing 0316

Standard Concrete Sidewalk

Date 1/12/2000



ISOMETRIC VIEW



SECTION RAMP FLOOR DETAIL

INSET A
SEE NOTE 1

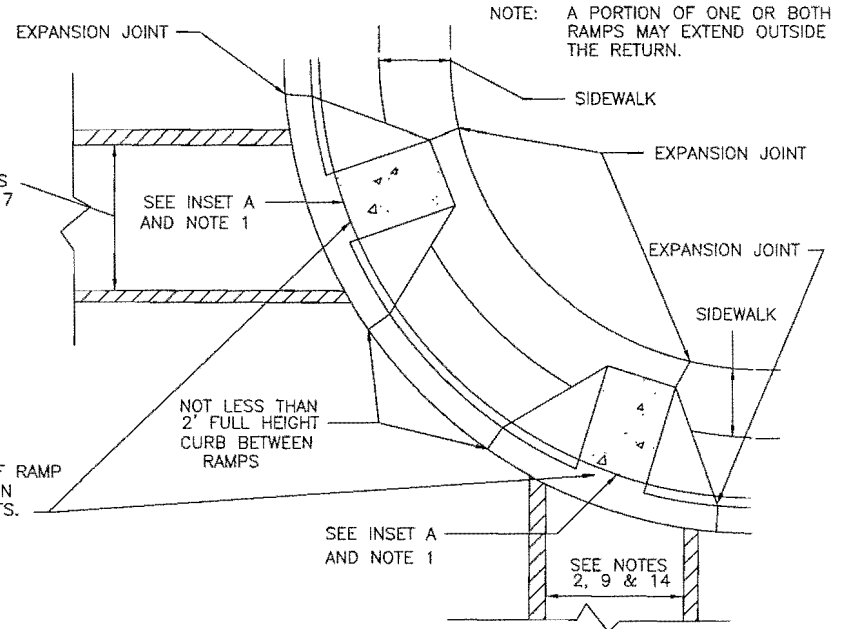
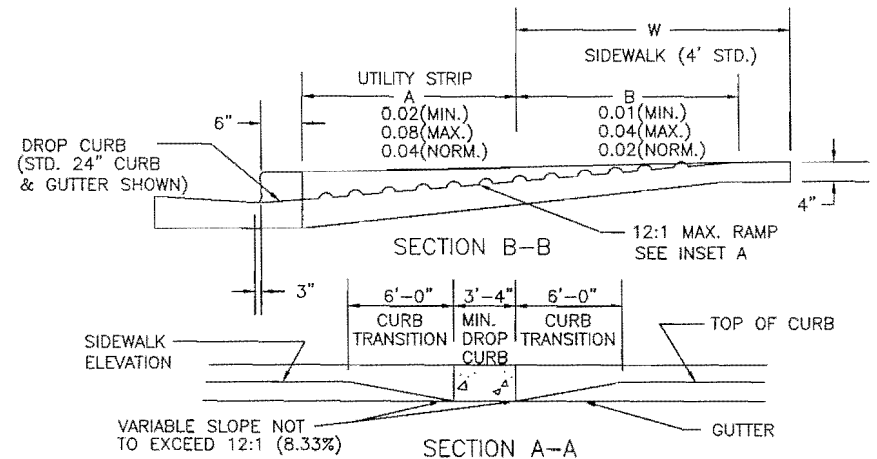
W	A	W+A+9'	X	B
5'	0.0'	5.8'	5.8'	5.0'*
6'	0.0'	6.8'	6.8'	6.0'***
7'	0.0'	7.8'	7.3'	6.5'***
8'	0.0'	8.8'	7.3'	6.5'***
5'	2.0'	7.8'	7.8'	5.0'
5'	2.5'	8.3'	8.1'	4.8'
5'	3.0'	8.8'	8.3'	4.4'
5'	3.5'	9.3'	8.4'	4.1'
5'	4.0'	9.8'	8.6'	3.8'
5'	4.5'	10.3'	8.7'	3.4'
5'	5.0'	10.8'	8.9'	3.1'

$B = X - (A + 9")$

B = DISTANCE FROM FRONT EDGE OF SIDEWALK TO BACK POINT OF 12:1 (8.33%) SLOPE.

* BACK OF SIDEWALK DROP REQUIRED FOR ALL SIDEWALK SLOPES.

** BACK OF SIDEWALK DROP REQUIRED FOR SIDEWALK SLOPES 0.04.



PLAN VIEW

NOTE: A PORTION OF ONE OR BOTH RAMPS MAY EXTEND OUTSIDE THE RETURN.

THIS PORTION OF RAMP MUST FALL WITHIN CROSSWALK LIMITS. (SEE NOTE 10)

NOT LESS THAN 2' FULL HEIGHT CURB BETWEEN RAMPS

SEE INSET A AND NOTE 1

SEE NOTES 2, 9 & 14

SMITHFIELD
NORTH CAROLINA



STANDARD DETAIL AND SPECIFICATIONS MANUAL

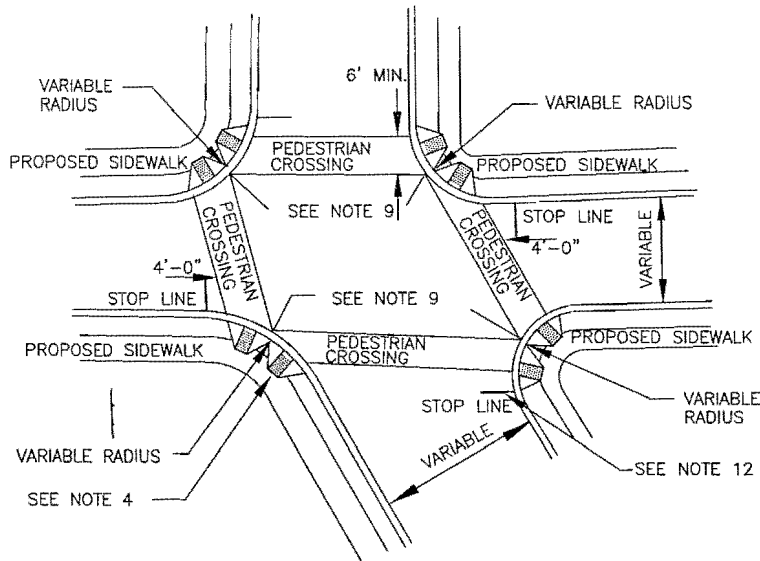
Drawing
0317A

Standard Wheelchair Ramp

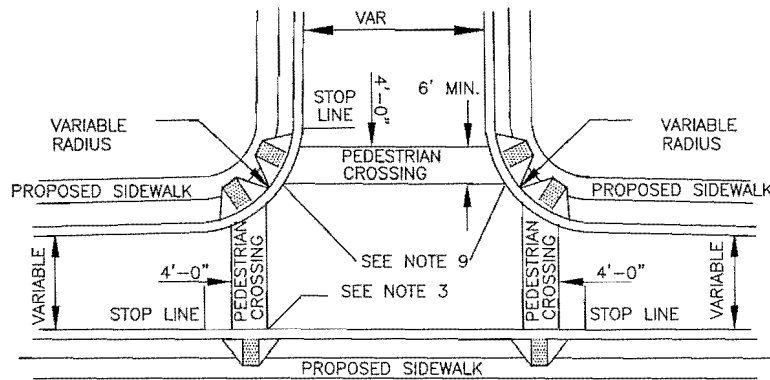
Date
1/12/2000

NOTES:

1. THE WALKING SURFACE SHALL BE SLIP RESISTANT. DETECTABLE WARNING DOMES SHALL COVER THE FULL WIDTH AND DEPTH OF THE RAMP FLOOR. THE DETECTABLE WARNINGS SHALL CONSIST OF RAISED TRUNCATED DOMES WITH A DIAMETER OF NOMINAL 0.9". A HEIGHT OF 0.3" AND CENTER-TO-CENTER SPACING OF NOMINAL 2.35". THE RAMP MAY BE YELLOW OR ANY COLOR WITH A 70% CONTRAST RATIO.
2. CROSSWALK WIDTHS AND CONFIGURATION VARY: MUST CONFORM TO TRAFFIC DESIGN STANDARDS.
3. NORTH CAROLINA GENERAL STATUTE 136-44 44 REQUIRES THAT ALL STREET CURBS BEING CONSTRUCTED OR RECONSTRUCTED FOR MAINTENANCE PROCEDURES, TRAFFIC OPERATIONS, REPAIRS, CORRECTION OF UTILITIES OR ALTERED FOR ANY REASON AFTER SEPTEMBER 1, 1973 SHALL PROVIDE WHEEL CHAIR RAMP FOR THE PHYSICALLY HANDICAPPED AT ALL INTERSECTIONS WHERE BOTH CURB AND GUTTER AND SIDEWALKS ARE PROVIDED AND AT OTHER POINTS OF PEDESTRIAN FLOW. IN ADDITION SECTION 228 OF THE 1973 FEDERAL AND HIGHWAY SAFETY ACT REQUIRES PROVISION OF CURBRAMPS ON ANY CURB CONSTRUCTION AFTER JULY 1 1976 WHETHER A SIDEWALK IS PROPOSED INITIALLY OR IS PLANNED FOR FUTURE DATE THE AMERICANS WITH DISABILITY ACT (ADA) OF 1990 EXTENDS TO INDIVIDUALS WITH DISABILITIES, COMPREHENSIVE CIVIL RIGHTS PROTECTIONS SIMILAR TO THOSE PROVIDED TO PERSONS ON THE BASIS OF RACE, SEX, NATIONAL ORIGIN AND RELIGION UNDER THE CIVIL RIGHTS ACT OF 1964. THESE CURB RAMPS HAVE BEEN DESIGNED TO COMPLY WITH TITLE 111 OF THE ADA, BECOMING EFFECTIVE ON JANUARY 26, 1992.
4. WHEELCHAIR RAMPS SHALL BE PROVIDED AT LOCATIONS AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. WHEELCHAIR RAMPS SHALL BE LOCATED AS INDICATED IN THESE DETAILS. HOWEVER THE LOCATION MAY BE ADJUSTED BY THE ENGINEER WHERE EXISTING LIGHT POLES, FIRE HYDRANTS, DROP INLETS ETC. AFFECT PLACEMENT. AT ALL LOCATIONS, NOT LESS THAN 2 FEET OF FULL HEIGHT CURB SHALL BE PLACED BETWEEN THE RAMPS.
5. NO SLOPE ON THE WHEELCHAIR RAMP SHALL EXCEED 1"/1' (12:1) IN RELATIONSHIP TO THE GRADE OF THE STREET.
6. IN NO CASE SHALL THE WIDTH OF THE WHEELCHAIR RAMP BE LESS THAN 40" (3'-4"). HOWEVER WIDTH MAY EXCEED 40"
7. USE CLASS "B" CONCRETE WITH A SIDEWALK FINISH IN ORDER TO OBTAIN A ROUGH NON-SKID TYPE SURFACE. (SEE DETAIL 317A)
8. A 1/2" EXPANSION JOINT WILL BE REQUIRED WHERE THE CONCRETE WHEELCHAIR RAMP JOINS THE CURB.
9. THE INSIDE PEDESTRIAN CROSSWALK LINES SHALL BE SET NO CLOSER IN THE INTERSECTION THAN WOULD BE ESTABLISHED BY BISECTING THE INTERSECTION RADII. (SEE NOTE 14)
10. THE CURB CUT AND THE PEDESTRIAN CROSSWALK LINES SHALL BE COORDINATED SO THAT THE BEGINNING OF THE WHEELCHAIR RAMP WILL FALL WITHIN THE PEDESTRIAN CROSSWALK LINES.
11. THE MINIMUM WIDTH OF THE PEDESTRIAN CROSSWALK SHALL BE 6 FEET. A CROSSWALK WIDTH OF 10' OR GREATER IS DESIRABLE.
12. STOP LINES, NORMALLY PERPENDICULAR TO THE LANE LINES, SHALL BE USED WHERE IT IS IMPORTANT TO INDICATE THE POINT BEHIND WHICH VEHICLES ARE REQUIRED TO STOP IN COMPLIANCE WITH A TRAFFIC SIGNAL STOP SIGN OR OTHER LEGAL REQUIREMENT. AND UNUSUAL APPROACH SKEW MAY REQUIRE THE PLACEMENT OF THE STOP LINE TO BE PARALLEL TO THE INTERSECTING ROADWAY.
13. PARKING SHALL BE ELIMINATED A MINIMUM OF 20 FEET BACK OF PEDESTRIAN CROSSWALK.
14. ALL PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION AND THE NORTH CAROLINA SUPPLEMENT OF THE MUTCD.




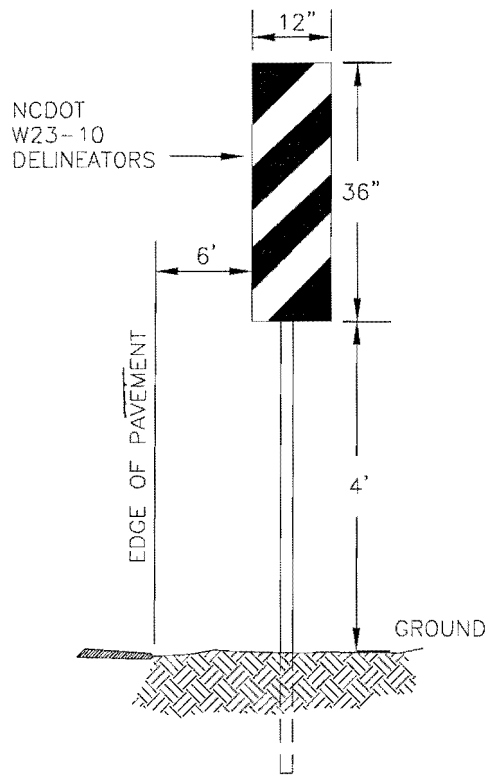
DETAIL SHOWING TYPICAL LOCATION OF WHEELCHAIR RAMPS, PEDESTRIAN CROSSWALKS AND STOP BARS



DETAIL SHOWING TYPICAL LOCATION OF WHEELCHAIR RAMPS, PEDESTRIAN CROSSWALKS AND STOP BARS FOR TEE INTERSECTION

Standard Wheelchair Ramp	SMITHFIELD NORTH CAROLINA	STANDARD DETAIL AND SPECIFICATIONS MANUAL
		Drawing 0317B
Date 1/12/2000		



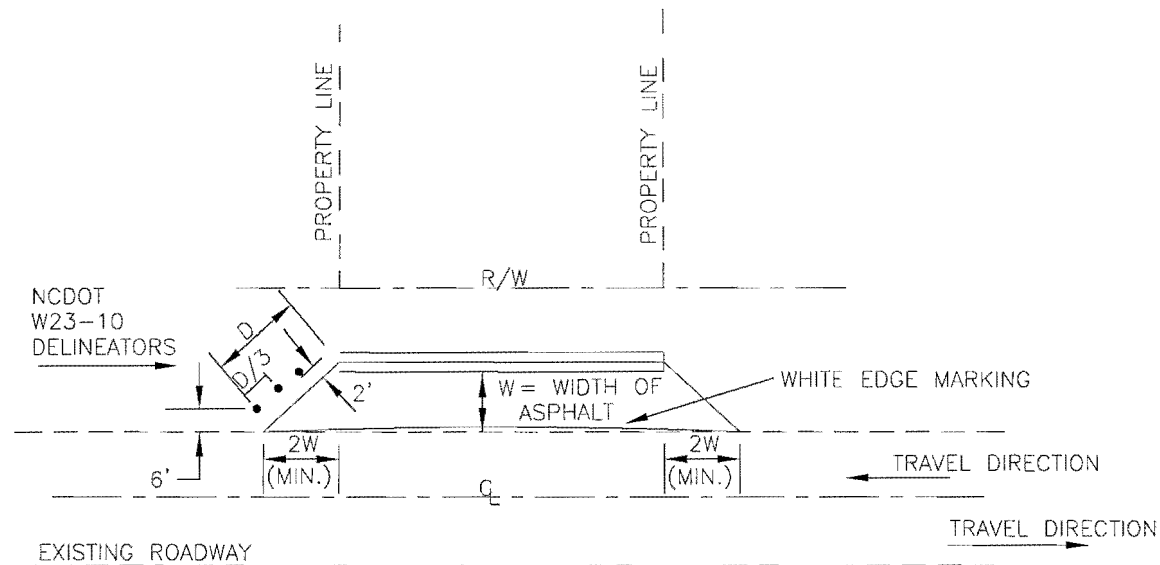


- A. BOTTOM EDGE OF DELINEATOR 4' ABOVE ROADWAY.
- B. THE DELINEATOR STRIPES SHALL SLOPE UPWARD AND OUTWARD FROM TRAFFIC.
- C. DELINEATORS TO BE SPACED ON CENTER AT $1/3$ OF THE DISTANCE D SHOWN BELOW FOR NEW ASPHALT WIDTHS ≤ 15 FT OR AT $1/4$ OF D FOR NEW ASPHALT WIDTHS > 15 FT.
- D. DELINEATORS SHALL BE MOUNTED ON BREAKAWAY POSTS.
- E. DELINEATORS SHALL BE REFLECTORIZED.

NOTES:

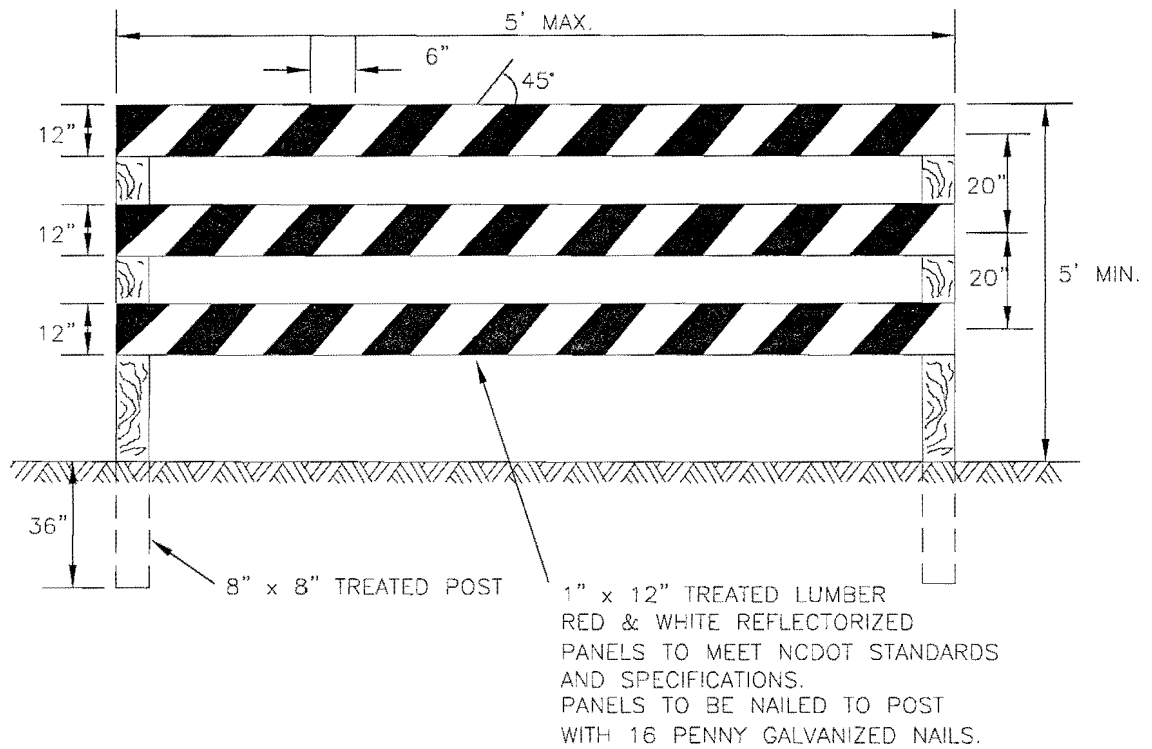
1. TAPER ON BOTH ENDS OF ROADWAY WIDENING SHALL BE A MINIMUM 2:1. THE TOWN ENGINEER AND/OR NCDOT RESERVE THE RIGHT TO REQUIRE A LONGER TAPER IF DEEMED NECESSARY FOR THE SAFETY OF THE PUBLIC.
2. A SOLID WHITE EDGE MARKING SHALL BE EXTENDED ALONG WIDENING AT EXISTING PAVEMENT.
3. DELINEATORS SHALL ONLY BE REQUIRED AT TAPER FROM CURB TO EXISTING PAVEMENT IN DIRECTION OF TRAVEL.
4. DELINEATORS SHALL BE ORIENTED SUCH THAT THE FACE OF THE SIGN IS PERPENDICULAR TO TRAVEL LANE.

DETAIL



PLAN VIEW

Standard Pavement Widening Taper and Markings	STANDARD DETAIL AND SPECIFICATIONS MANUAL	SMITHFIELD NORTH CAROLINA	
Date 1/14/2000			



NOTES:

- 1 BARRICADE TO BE ERECTED ACROSS ENTIRE ROADWAY INCLUDING CURB & GUTTER.
- 2 ADVANCE WARNING SIGN W14-1 (DEAD END) SHALL BE PLACED JUST AFTER LAST INTERSECTING STREET.

SMITHFIELD
NORTH CAROLINA

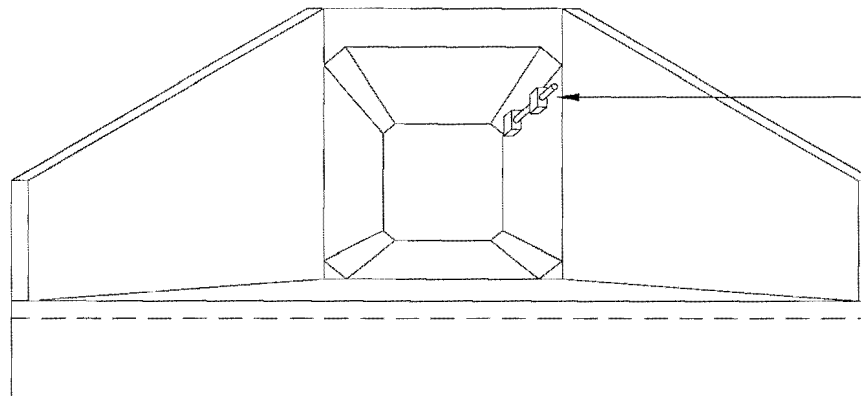
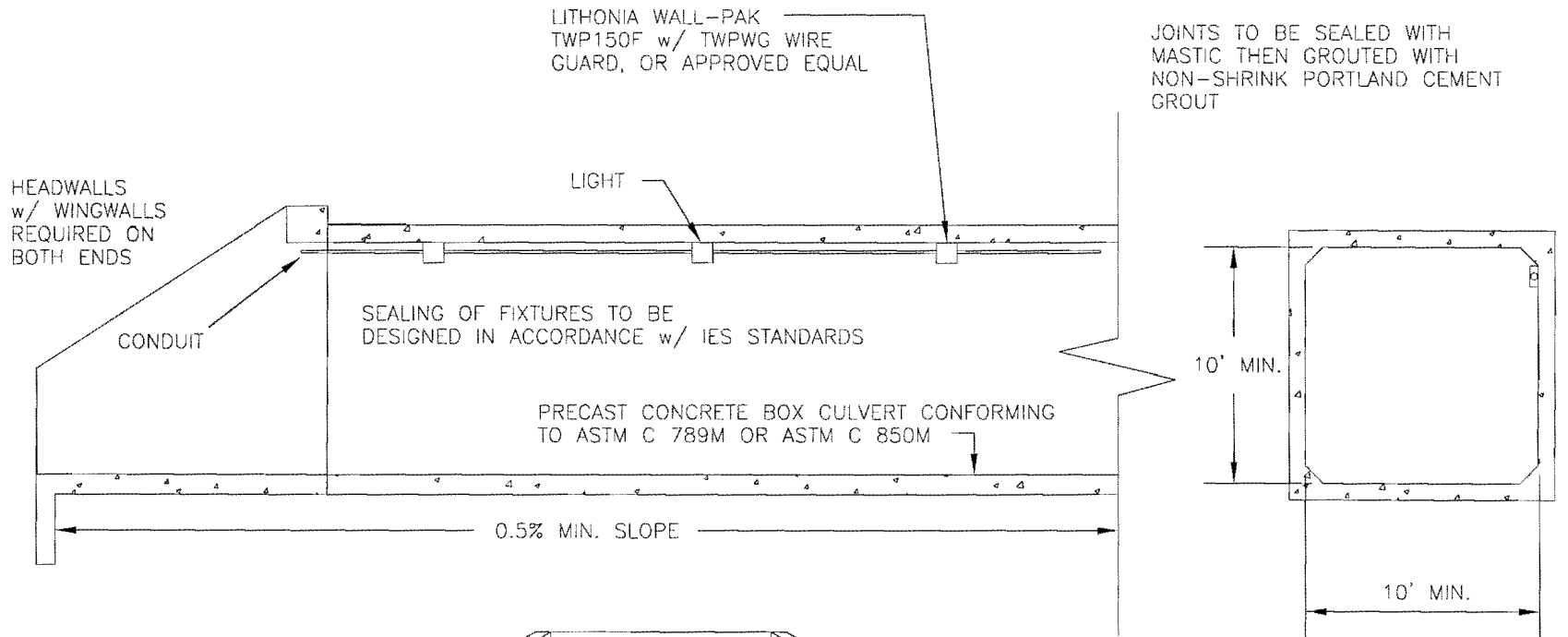


STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Drawing
0319

Temporary Barricade
for Dead End Roads

Date
1/14/2000



FRONT VIEW

NOTES:

APPROPRIATE SIGNAGE MAY BE REQUIRED
AT ENTRANCE TO INDICATE NARROWING TRAIL
WIDTH AND LIMITED VERTICAL CLEARANCE.

SMITHFIELD
NORTH CAROLINA

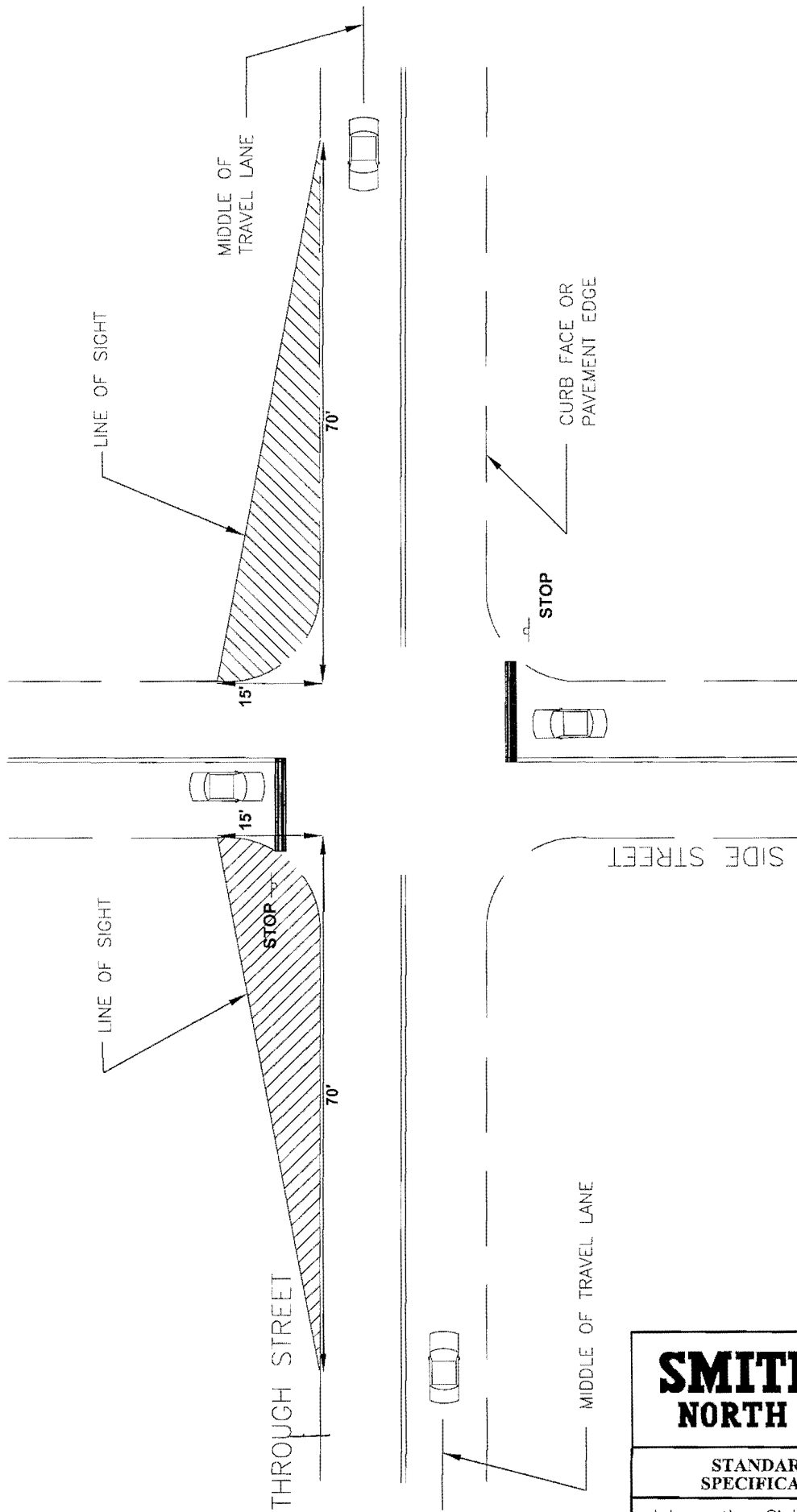


STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Precast Concrete
Pedestrian/Bicycle Underpass

Drawing
0320

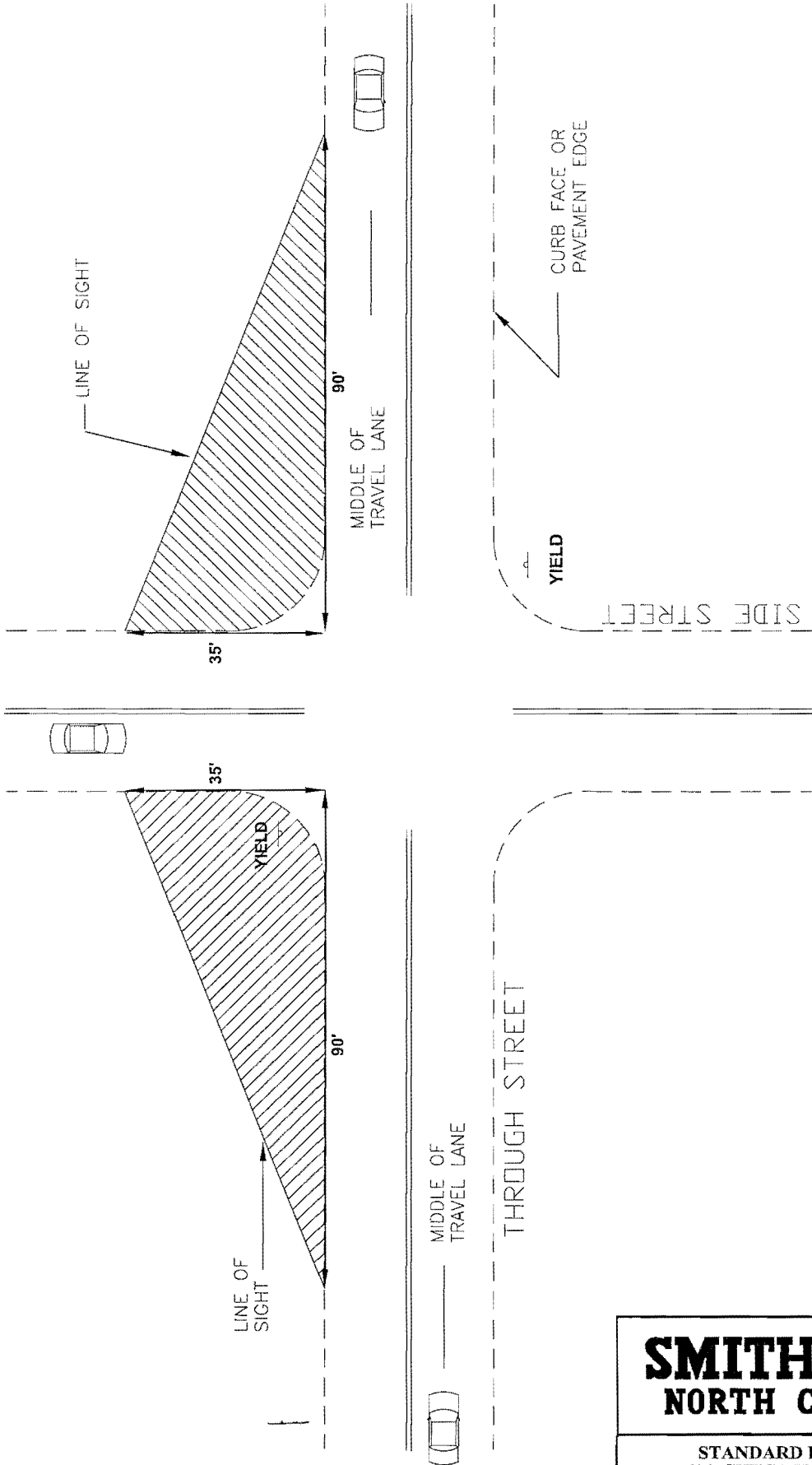
Date
1/14/2000



SMITHFIELD NORTH CAROLINA



STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing 0321
Intersection Sight Distance Stop Sign Control (Through Street 25 to 35 mph)	Date 1/14/2000



SMITHFIELD NORTH CAROLINA



STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing 0322
Sight Distance Yield Sign Controlled Intersections (Through Street - Above 45 mph)	Date 1/14/2000

**SECTION 4.00
SOIL EROSION AND SEDIMENTATION CONTROL**

4.01 SCHEDULING

Temporary and permanent erosion control measures shall be provided for all land disturbing work in accordance with an erosion control plan approved by the NCDEHNR for sites where over an acre of land is disturbed. The Town reserves the right to require that soil erosion and sedimentation control measures be established for sites where disturbed areas will be less than one acre. All permanent erosion control measures shall be incorporated into the work at the earliest practical time. All temporary measures shall be maintained until the permanent measures have taken effect. Temporary and permanent measures shall be coordinated to provide effective and continuous erosion control throughout the construction and post-construction period to minimize siltation of streams, lakes, reservoirs, and other impoundments, ground surfaces, and other property.

4.02 TEMPORARY MEASURES

Silt Fence shall be installed at the toe of all fill slopes and any other necessary locations as required. Silt fence shall be erected in accordance with Standard Detail 4.01.

Diversion Ditches shall be installed at the top of cut and fill slopes and any other necessary locations as required. Diversion ditches shall be installed in accordance with Standard Detail 4.08.

Construction Entrances shall be installed at all points of access to construction sites. Any access point which does not have a construction entrance shall be barricaded to prevent its use. Construction entrances shall be installed in accordance with Standard Detail 4.07.

Sediment Pits or Filter Basins shall be installed at all points where accumulated runoff is released to natural drainage channels as required. Sediment pits and filter basins shall be sized to hold 1800 cubic feet of sediment for every acre of denuded area tributary to the structure. Sediment basins shall be installed in accordance with Standard Detail 4.02. Filter basins shall be installed in accordance with Standard Detail 4.03 - 4.05.

Temporary Seed is the use of rapid growing annual grasses, small grains or legumes to provide initial, temporary cover for erosion control on disturbed areas for less than twelve (12) months. Seed bed preparations and soil amendments shall be in accordance with the method described under "Seeding and Mulching".

Seeding and Mulching shall be done immediately behind construction. All disturbed areas shall be dressed to a depth of 5 inches. The top 2 inches shall be pulverized to provide a uniform seedbed. Agricultural lime shall be applied at the rate of 95 lbs./1000 sq. ft. immediately before plowing. Grass seed shall be applied at the rates outlined in Tables 4.1 and 4.2.

SMITHFIELD NORTH CAROLINA		
STANDARD DETAIL AND SPECIFICATIONS MANUAL		Drawing SPEC4_1
SECTION 4 EROSION AND SEDIMENTATION CONTROL		Date 2/1/2000

5-10-10 fertilizer shall be applied to all disturbed areas at a rate of 21 lbs./1000 sq. ft. mulching shall consist of small grain straw applied at a rate of 70 lbs./1000 sq. ft. Mulched areas shall be tacked with asphalt or other approved method sufficient to hold the straw in place, 200 to 400 gallons per acre.

If active construction ceases in any area for more than 30 days all disturbed areas must be seeded, mulched, and tacked unless written approval is granted by the Town.

4.03 PERMANENT MEASURES

Ground Cover

After construction is complete, all disturbed areas shall receive a permanent ground cover in accordance with the seeding and mulching schedule in Section 4.02 "Seeding and Mulching". Permanent seeding and temporary seeding differ only in the type of seed to be used – annual versus perennial.

Permanent Ground Cover is the establishment of perennial vegetation cover for periods longer than twelve (12) months. Seed bed preparations and soil amendments shall be in accordance with Section 4.02 "Seeding and Mulching". As a part of permanent seeding, maintenance may be required to maintain vegetative growth for twelve (12) months. This maintenance shall be considered a part of establishing permanent ground cover.

Riprap Dissipation Pads and Riprap Protection

After construction is complete, all points of stormwater release shall be protected by riprap dissipation pads designed to reduce discharge velocities to nonerosive levels.

The dissipation pads shall be designed and constructed with either an engineering fabric or washed stone barrier between the dissipation pad and the natural ground. Calculations shall be furnished to indicate the sufficiency of the dissipation pads specified. Riprap pad design shall be in accordance with NYDOT or SCS methods. Filter fabric, or a washed stone liner shall be used on all sediment basins, riprap dissipators, or channel designs.

4.04 COMPUTATIONS

Erosion and sedimentation control measures, structures, and devices shall be planned, designed, and constructed to control the calculated peak runoff from a 10-year frequency storm. Runoff rates shall be calculated using the USDA Soil Conservation Service Method, the Rational Method, or other acceptable calculation procedures. Runoff computations shall be based on rainfall data published by the National Weather service for this area.

4.05 CONSTRUCTION SEQUENCE

The construction sequence on projects shall be as follows:

 	
STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing SPEC4_2
SECTION 4.00 SOIL EROSION AND SEDIMENTATION CONTROL	Date 2/1/2000

1. Sedimentation and Erosion Control Plan Approval – NCDEHNR/Town;
2. Install all erosion control measures as required;
3. Proceed with grading;
4. Clean sediment basins when one-half full;
5. Seed and mulch denuded area within thirty (30) days after finished grades are established;
6. Maintain soil erosion control measures until permanent ground cover is established;
7. Remove soil erosion control measures and stabilize these areas.

END OF SECTION 4.00

SMITHFIELD
NORTH CAROLINA

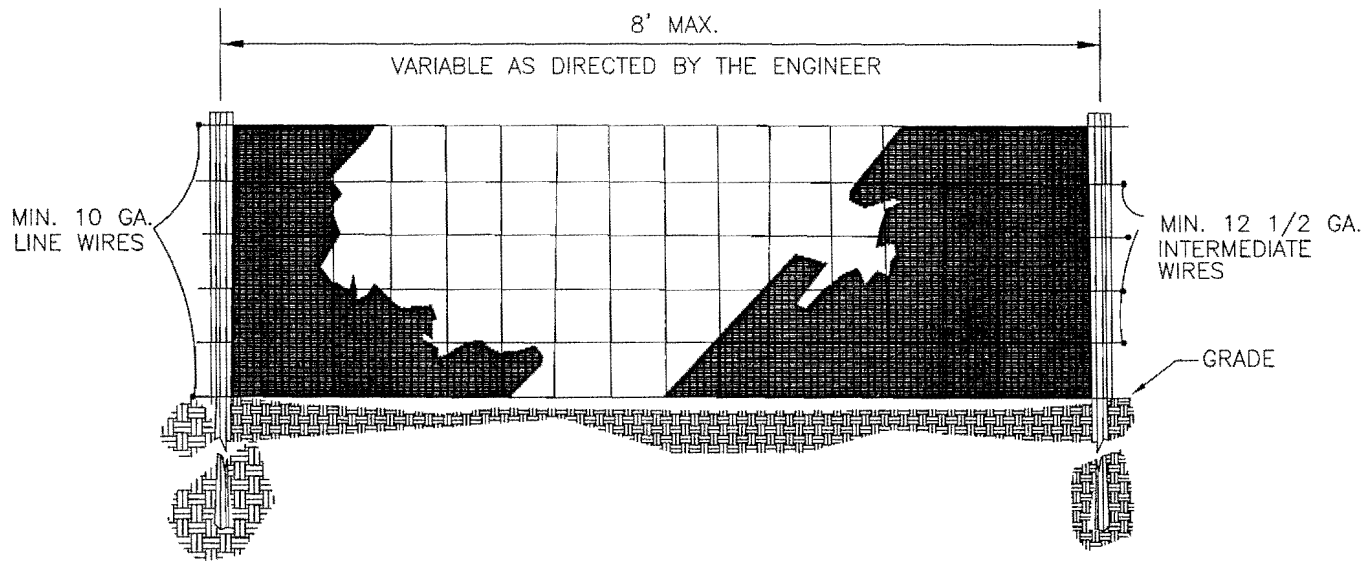


**STANDARD DETAIL AND
SPECIFICATIONS MANUAL**

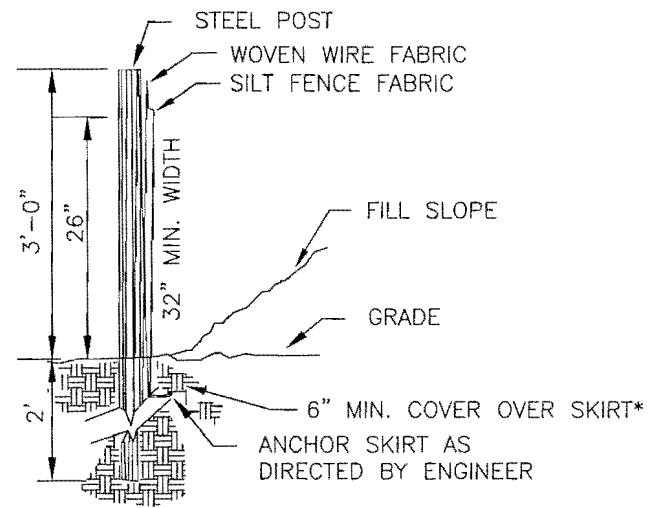
Drawing
SPEC4_3

SECTION 4 SOIL
EROSION AND SEDIMENTATION CONTROL

Date
2/1/2000



FRONT VIEW



SIDE VIEW

NOTES:

- USE SILT FENCE ONLY WHEN DRAINAGE AREA DOES NOT EXCEED 1/4 ACRE AND NEVER IN AREAS OF CONCENTRATED FLOW

* FOR REPAIR OF SILT FENCE FAILURES, USE NO. 57 WASHED STONE

FOR ANCHOR WHEN SILT FENCE IS PROTECTING CATCH BASIN.

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NORTH CAROLINA



STANDARD DETAIL AND SPECIFICATIONS MANUAL

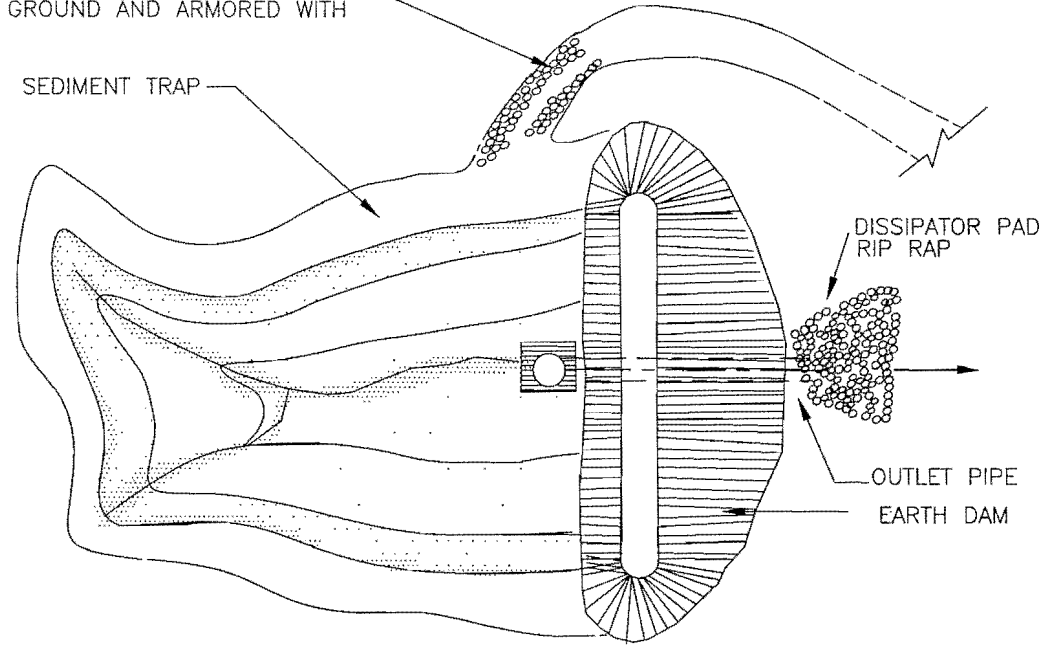
Standard Temporary Silt Fence

Drawing
0401

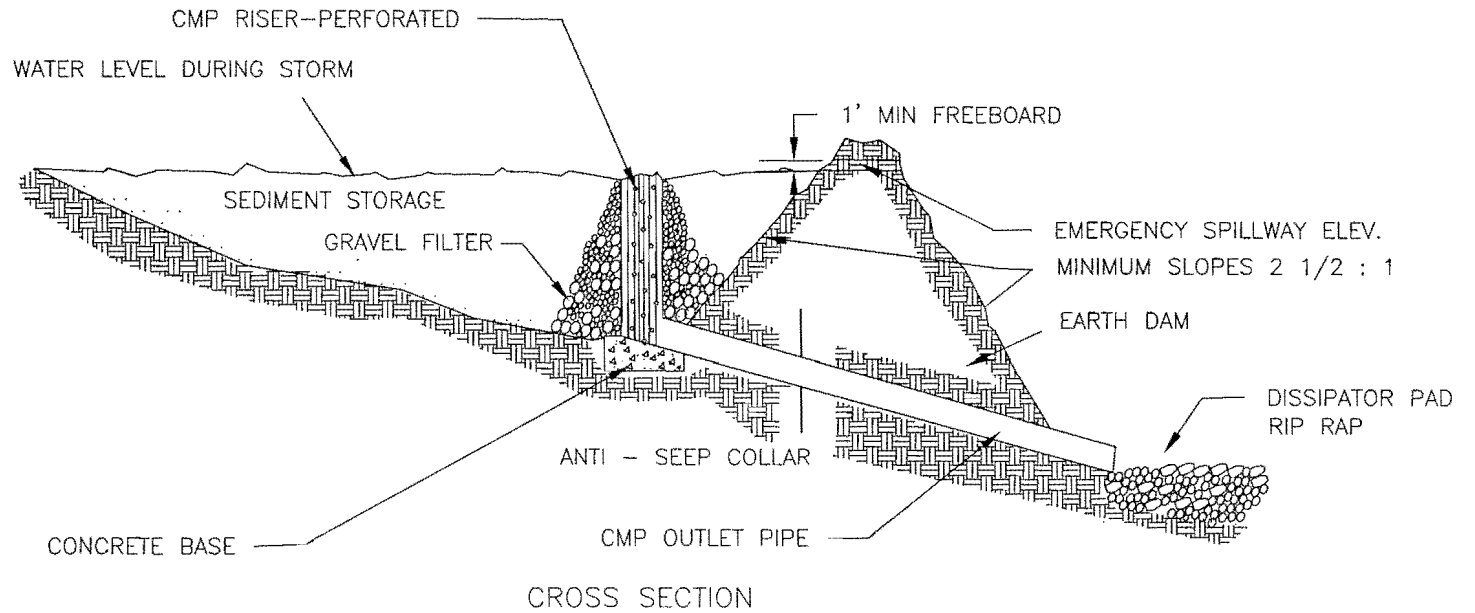
Date
1/11/2000

EMERGENCY SPILLWAY CONSTRUCTED OVER
UNDISTURBED GROUND AND ARMORED WITH
RIP RAP

SEDIMENT TRAP



PLAN VIEW



CROSS SECTION

SMITHFIELD
NORTH CAROLINA



STANDARD DETAIL AND
SPECIFICATIONS MANUAL

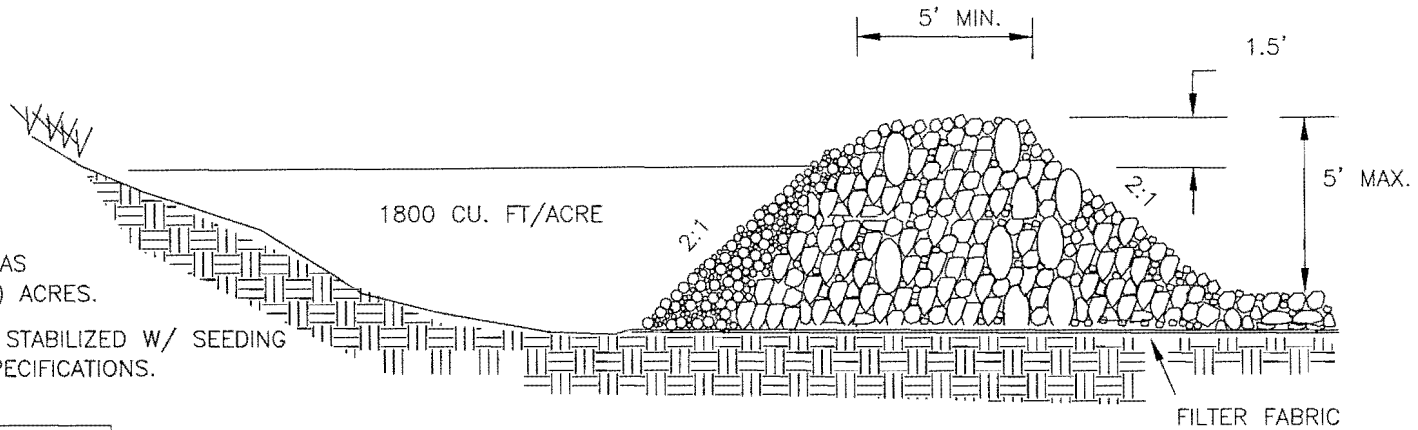
Standard Riser--Barrel Sediment Basin

Drawing
0402

Date
1/12/2000

NOTES:

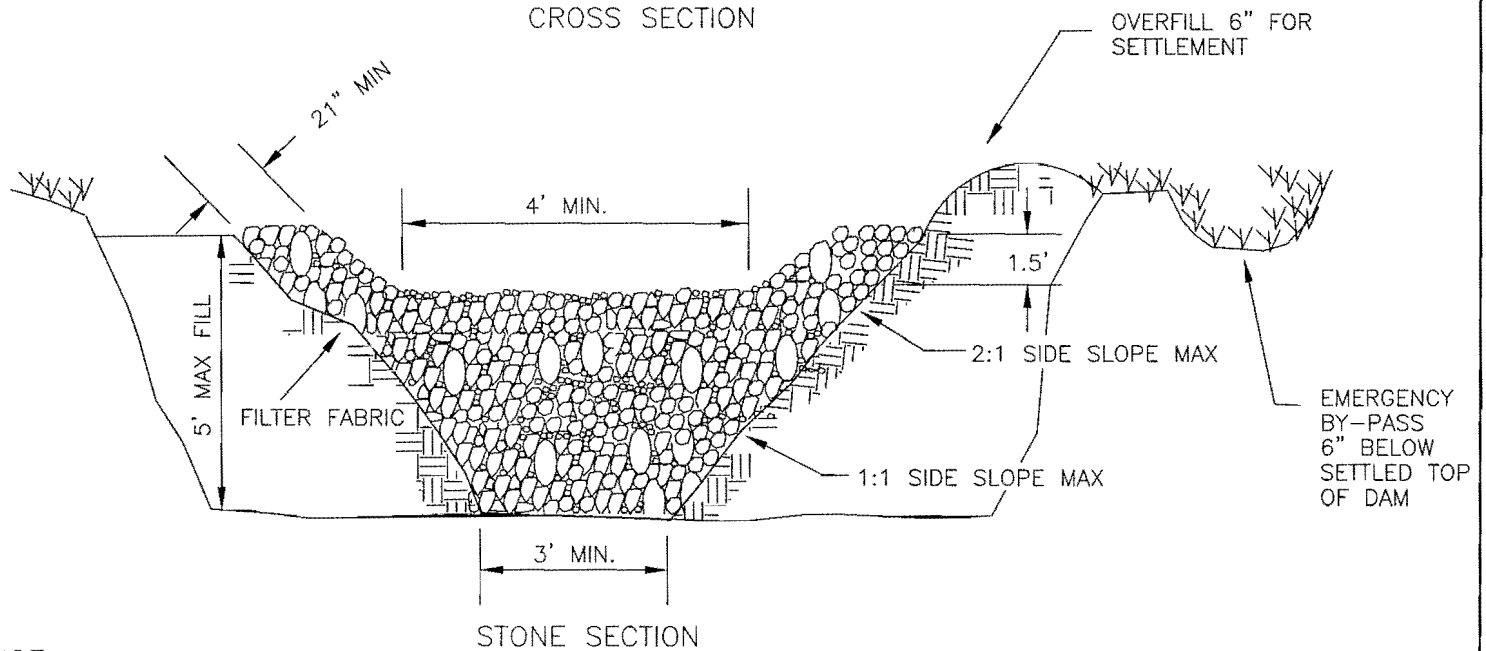
1. USE FOR DRAINAGE AREAS NOT EXCEEDING 5 (FIVE) ACRES.
2. EARTH BERM SHALL BE STABILIZED W/ SEEDING ACCORDING TO TOWN SPECIFICATIONS.



DESIGN OF SPILLWAYS

DRAINAGE AREA (ACRES)	WEIR LENGTH (FT.)
1	4.0
2	6.0
3	8.0
4	10.0
5	12.0

¹ DIMENSIONS SHOWN ARE MINIMUM



MAINTENANCE

INSPECT TEMPORARY SEDIMENT TRAPS AFTER EACH PERIOD OF SIGNIFICANT RAINFALL. REMOVE SEDIMENT AND RESTORE TRAP TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-HALF THE DESIGN DEPTH OF THE TRAP. PLACE THE SEDIMENT THAT IS REMOVED IN A DESIGNATED DISPOSAL AREA AND REPLACE THE CONTAMINATED PART OF THE GRAVEL FACING.

CHECK THE STRUCTURE FOR DAMAGE FROM EROSION OR PIPING. PERIODICALLY CHECK THE DEPTH OF THE SPILLWAY TO ENSURE IT IS A MINIMUM OF 1.5 FT. BELOW THE LOW POINT OF THE EMBANKMENT. IMMEDIATELY FILL ANY SETTLEMENT OF THE EMBANKMENT TO SLIGHTLY ABOVE DESIGN GRADE. ANY RIP RAP DISPLACED FROM THE SPILLWAY MUST BE REPLACED IMMEDIATELY.

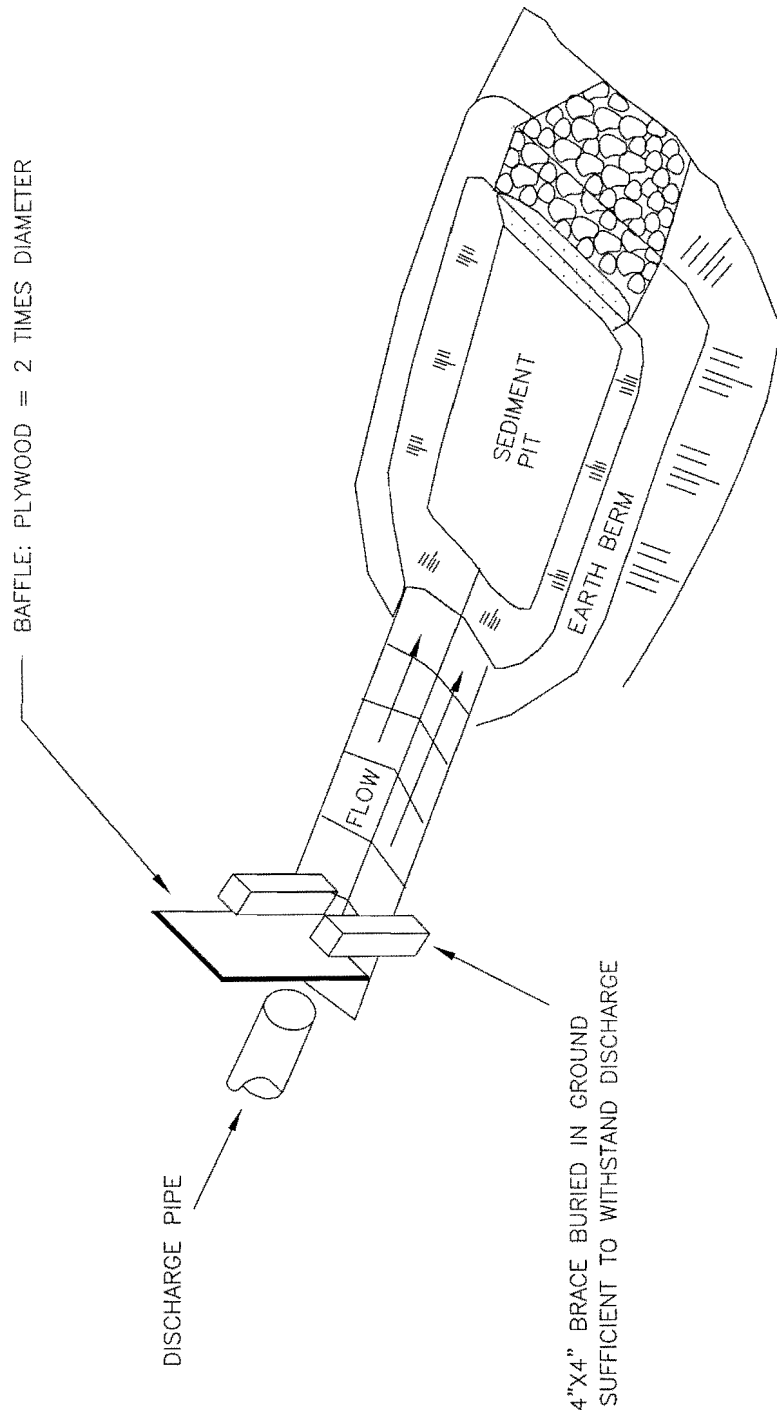
STABILIZE THE EMBANKMENT AND ALL DISTURBED AREAS ABOVE THE SEDIMENT POOL AND DOWNSTREAM FROM THE TRAP IMMEDIATELY AFTER CONSTRUCTION WITH SEEDING.

Gravel and Rip Rap Filter Basin

SMITHFIELD
NORTH CAROLINA


STANDARD DETAIL AND SPECIFICATIONS MANUAL

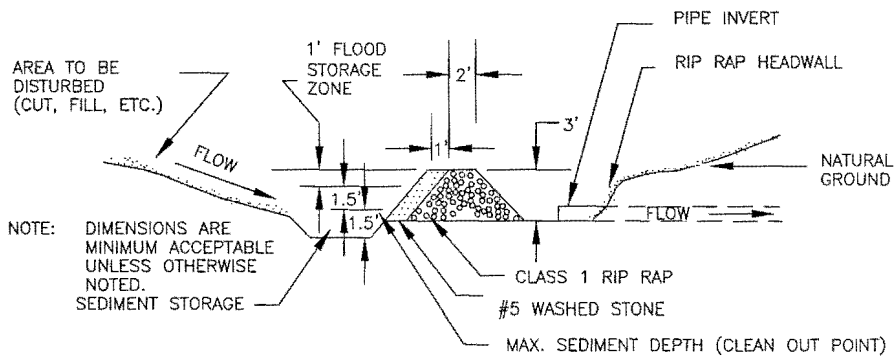
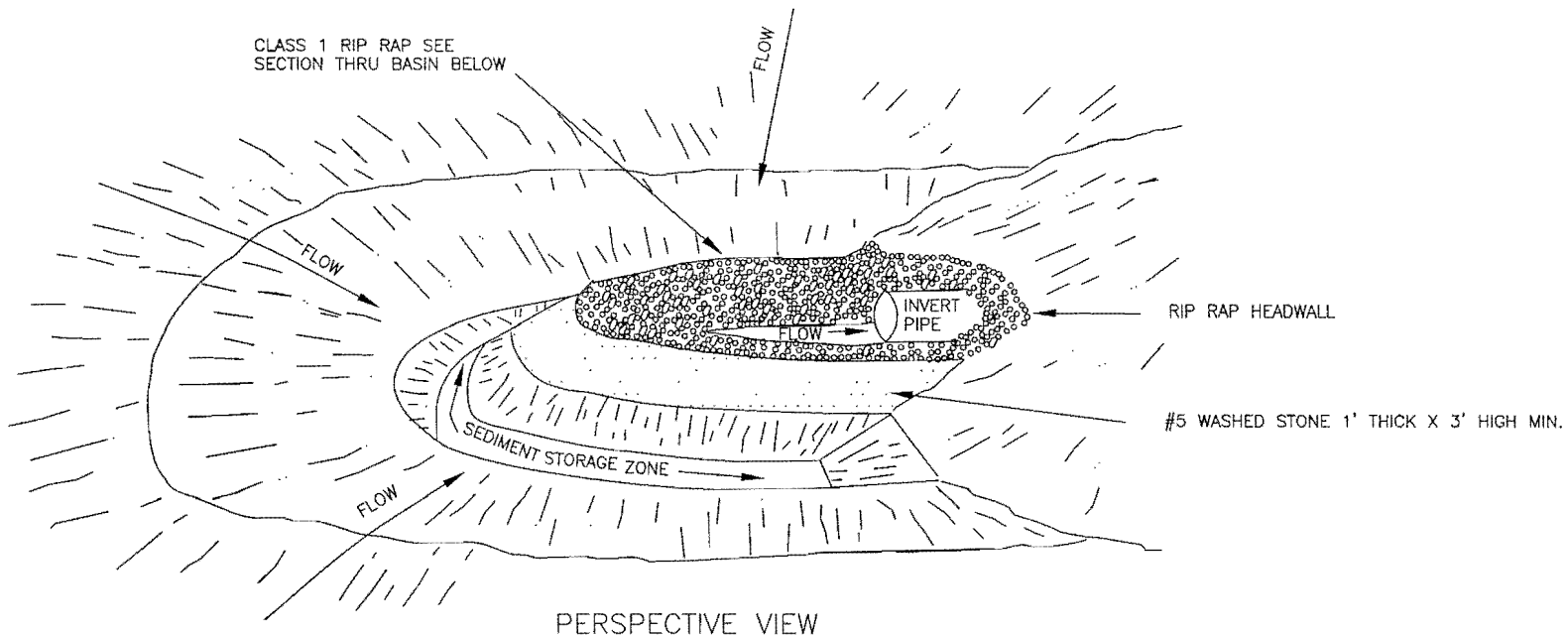
Drawing 0403A
Date 1/12/2000



PERSPECTIVE VIEW

NOTES:
 BAFFLE MAY BE PLYWOOD, RIP RAP DISSIPATOR
 OR OTHER APPROVED METHOD.

SMITHFIELD NORTH CAROLINA		
STANDARD DETAIL AND SPECIFICATIONS MANUAL		
Gravel & Rip Rap Filter Basin		Drawing 0403B
		Date 1/12/2000



NOTES:

GRAVEL & RIP RAP FILTER BERM BASIN DETAIL IS DESIGNED TO PROTECT EXISTING PIPE INVERTS THAT DRAIN 10 ACRES OR LESS.

SECTION THRU BASIN, FILTER AND CULVERT PIPE

SMITHFIELD
NORTH CAROLINA



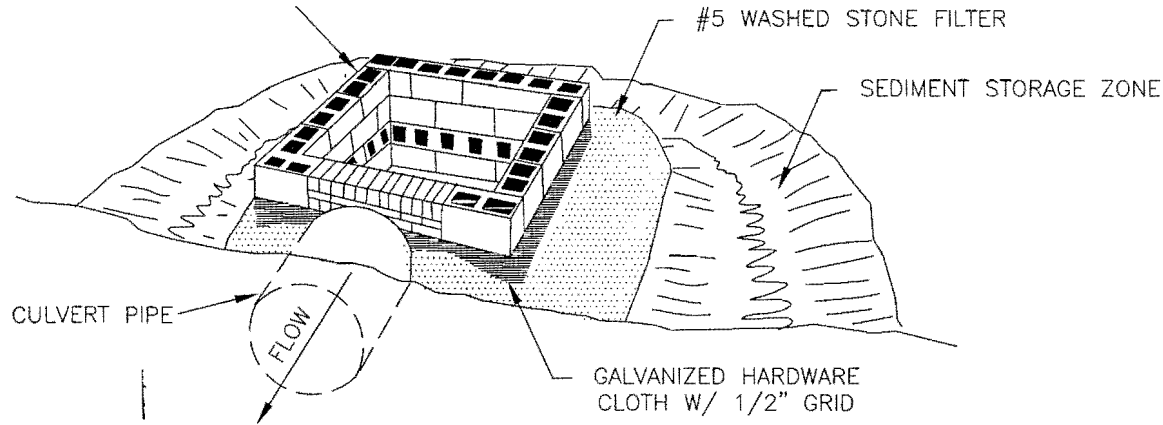
STANDARD DETAIL AND SPECIFICATIONS MANUAL

Gravel & Rip Rap Filter Berm Basin
Existing Pipe Inverts

Drawing
0404

Date
1/12/2000

CONCRETE BLOCK CATCH BASIN



PERSPECTIVE VIEW

NOTES:

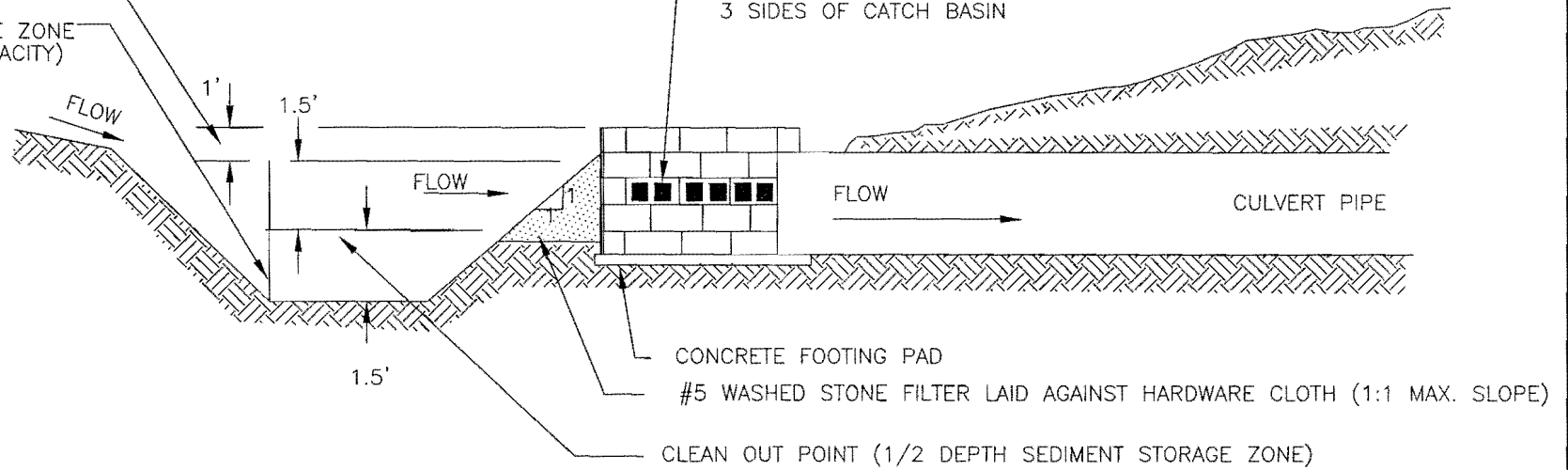
AT END OF PROJECT, CATCH BASIN CAN BE RAISED AS NEEDED PLUGGING OPEN COURSE OF BLOCK WITH MORTAR

RISER CAN BE BUILT AS A STANDARD CATCH BASIN/JUNCTION BOX (WITH WEEP HOLES) AND BE UTILIZED AS SUCH WHEN PROJECT IS STABLE.

GALVANIZED HARDWARE CLOTH 1/2" X 1/2" GRID
FLOOD STORAGE ZONE

SEDIMENT STORAGE ZONE
(TOTAL BASIN CAPACITY)

COURSE OF BLOCK LAID SIDWAYS ON 3 SIDES OF CATCH BASIN



SECTION VIEW

SMITHFIELD
NORTH CAROLINA

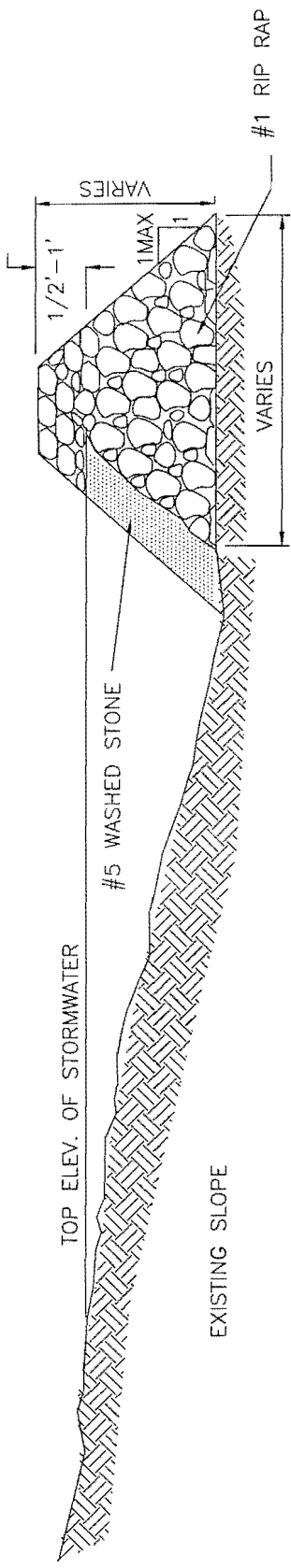
STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Catch Basin Riser / Filter

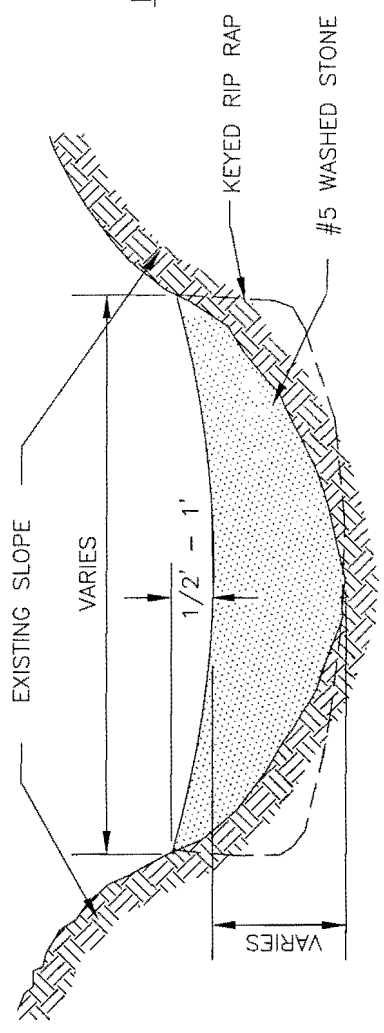


Drawing
0405

Date
1/12/2000



SIDE VIEW



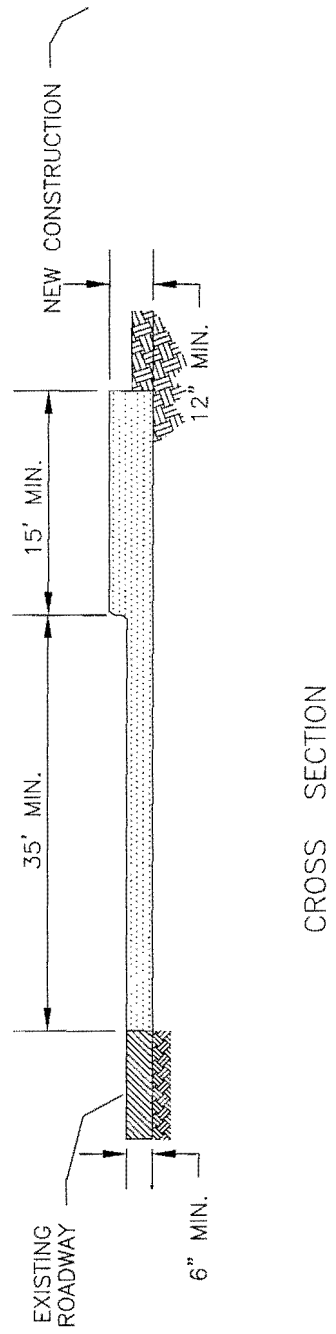
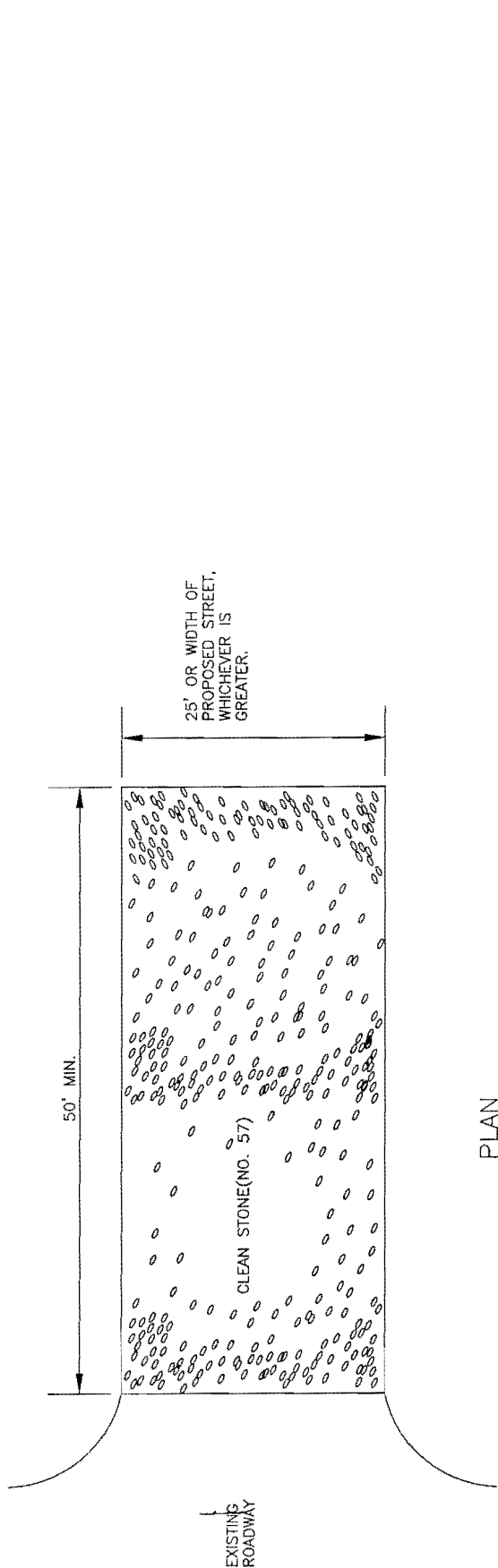
FRONT VIEW

NOTES:
 HEIGHT AND WIDTH DETERMINED BY
 EXISTING TOPOGRAPHY AND
 SEDIMENT STORAGE REQUIRED.
 KEY RIP RAP INTO THE DAM
 FOR STABILIZATION.

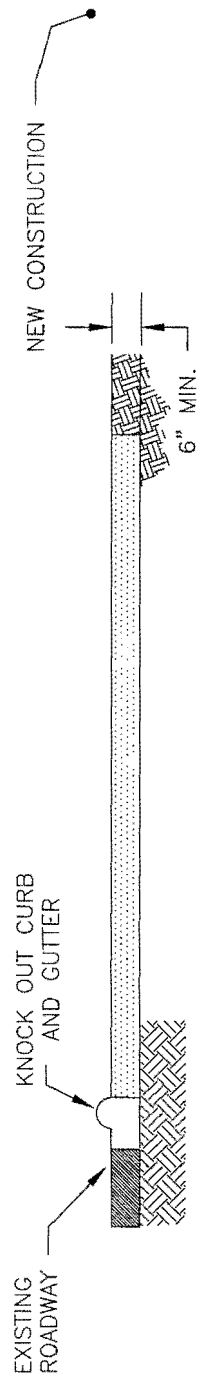
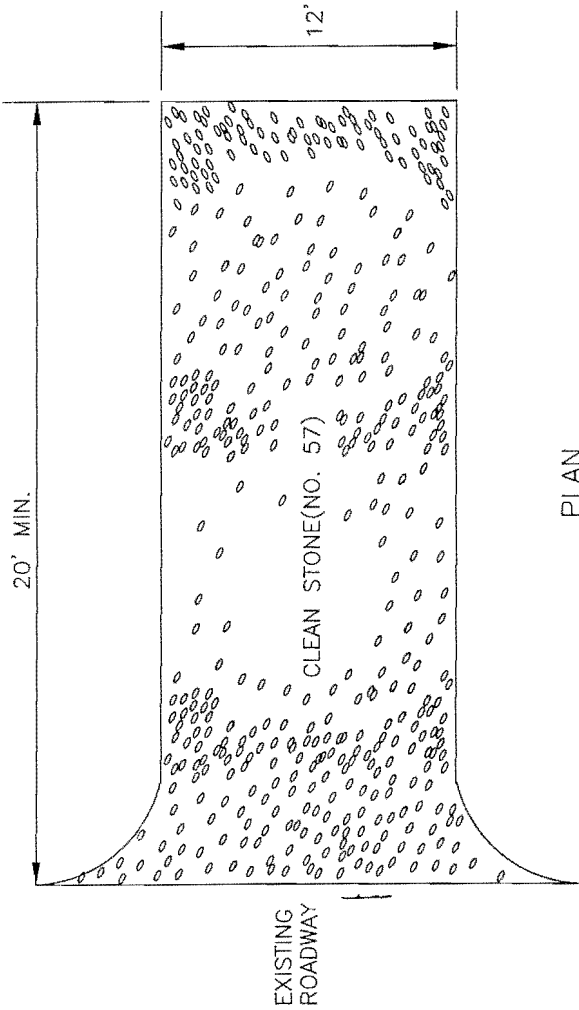
**SMITHFIELD
 NORTH CAROLINA**



STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing 0406
Check Dam	Date 1/12/2000



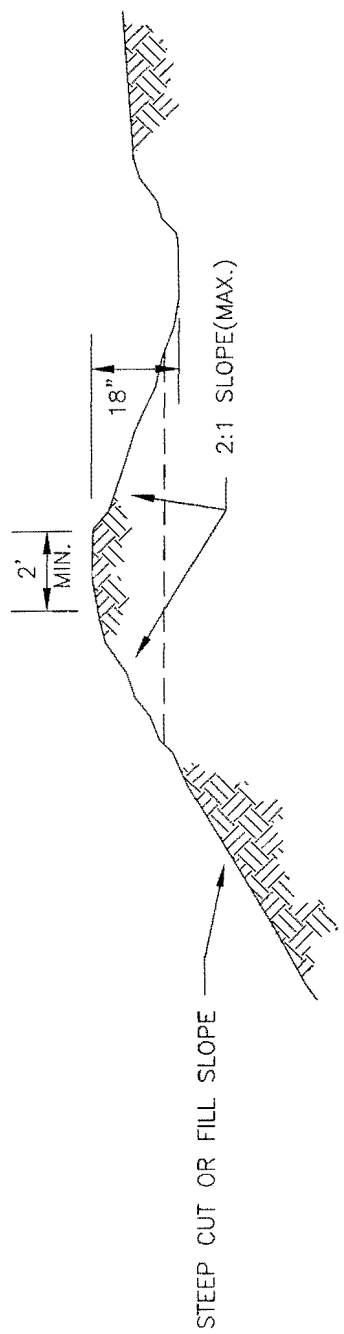
SMITHFIELD NORTH CAROLINA 	
STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing 0407
Construction Entrance	Date 1/12/2000



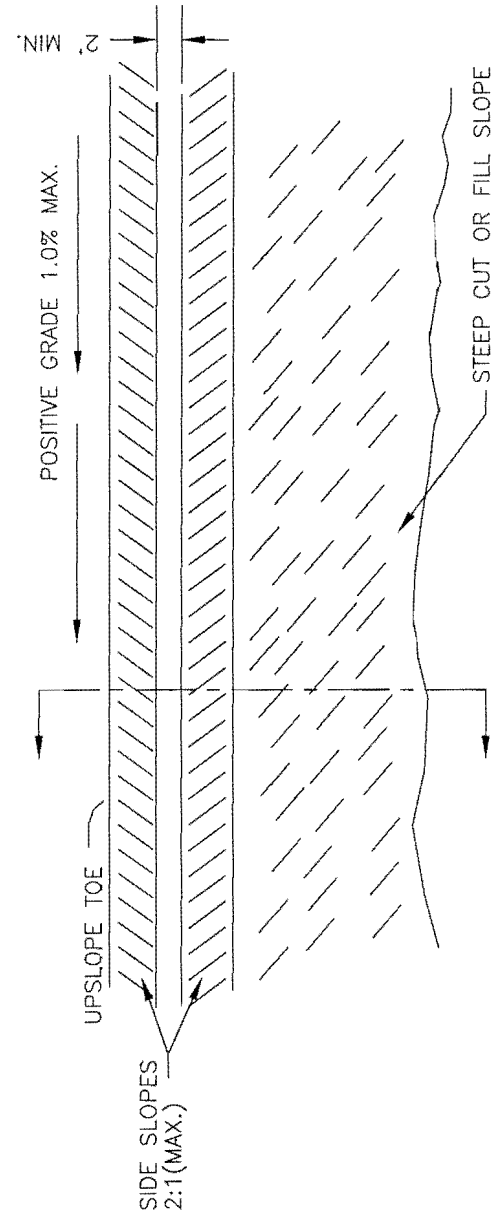
NOTES:

- REFER TO DWG STD. No 3.15--STANDARD DRIVEWAY APRON
- REFER TO DWG. STD. No 3.12--STANDARD METHOD OF REMOVING EXISTING CURB FABRIC MAY BE ADDED UNDER THE STONE WHICH WOULD ADD TOTAL LIFE TO THE CONSTRUCTION ENTRANCE
- THIS ENTRANCE APPLIES ONLY TO ENTRANCES OF INDIVIDUAL SINGLE FAMILY RESIDENTIAL UNITS.

<h1>SMITHFIELD</h1> <h2>NORTH CAROLINA</h2> 	
<p>STANDARD DETAIL AND SPECIFICATIONS MANUAL</p>	<p>Drawing 0408</p>
<p>Residential Construction Entrance</p>	<p>Date 1/12/2000</p>

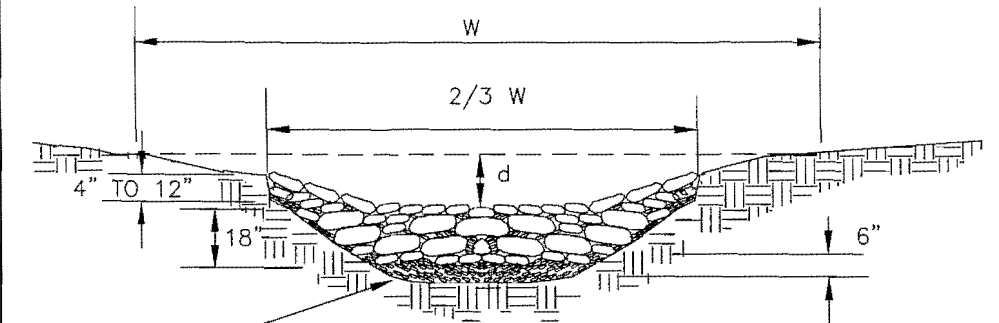


CROSS SECTION



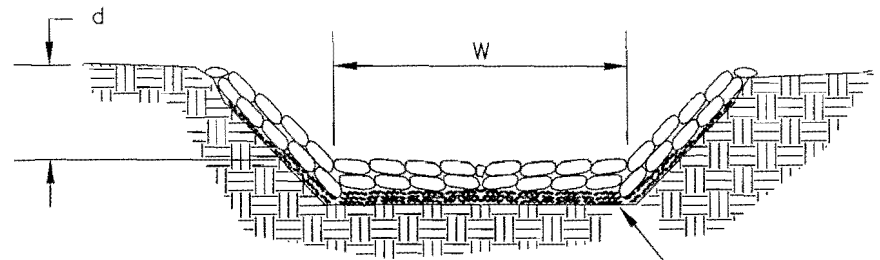
PLAN VIEW

SMITHFIELD NORTH CAROLINA 	
STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing 0409
Diversion Ditch	Date 1/12/2000



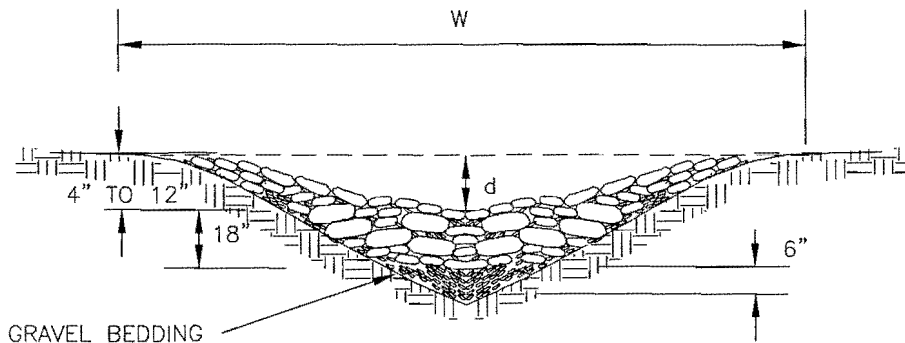
GRAVEL BEDDING
OR FILTER FABRIC

PARABOLIC-SHAPED WATERWAY WITH STONE CENTER DRAIN
(SHAPED BY BULLDOZER)



GRAVEL BEDDING
OR FILTER FABRIC

TRAPEZOIDAL



GRAVEL BEDDING
OR FILTER FABRIC

V-SHAPED WATERWAY WITH STONE CENTER DRAIN
(SHAPED BY MOTOR GRADER)

NOTES:

TO BE USED WHERE EXCESSIVE STORMWATER
VELOCITIES PROHIBIT VEGETATIVE LININGS.

SIZE OF STONE MUST BE DETERMINED BY
APPROPRIATE DESIGN PROCEDURE.

DIMENSIONS FOR d & W VARIES ACCORDING
TO DESIGN.

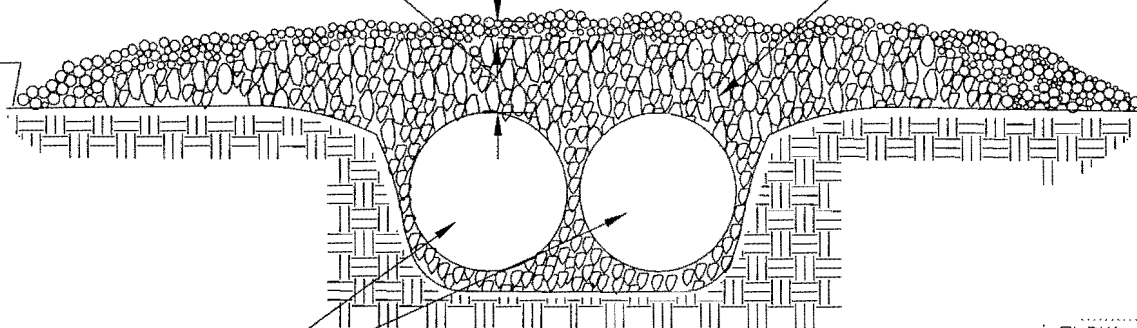
SMITHFIELD NORTH CAROLINA	
STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing 0410
Rip Rap Lined Channels	Date 1/12/2000

1/2 DIAMETER OF PIPE
OR 12" WHICH EVER IS
GREATER

COARSE AGGREGATE
6" DEEP

EARTH FILL COVERED BY
LARGE ANGULAR ROCK

FILTER FABRIC

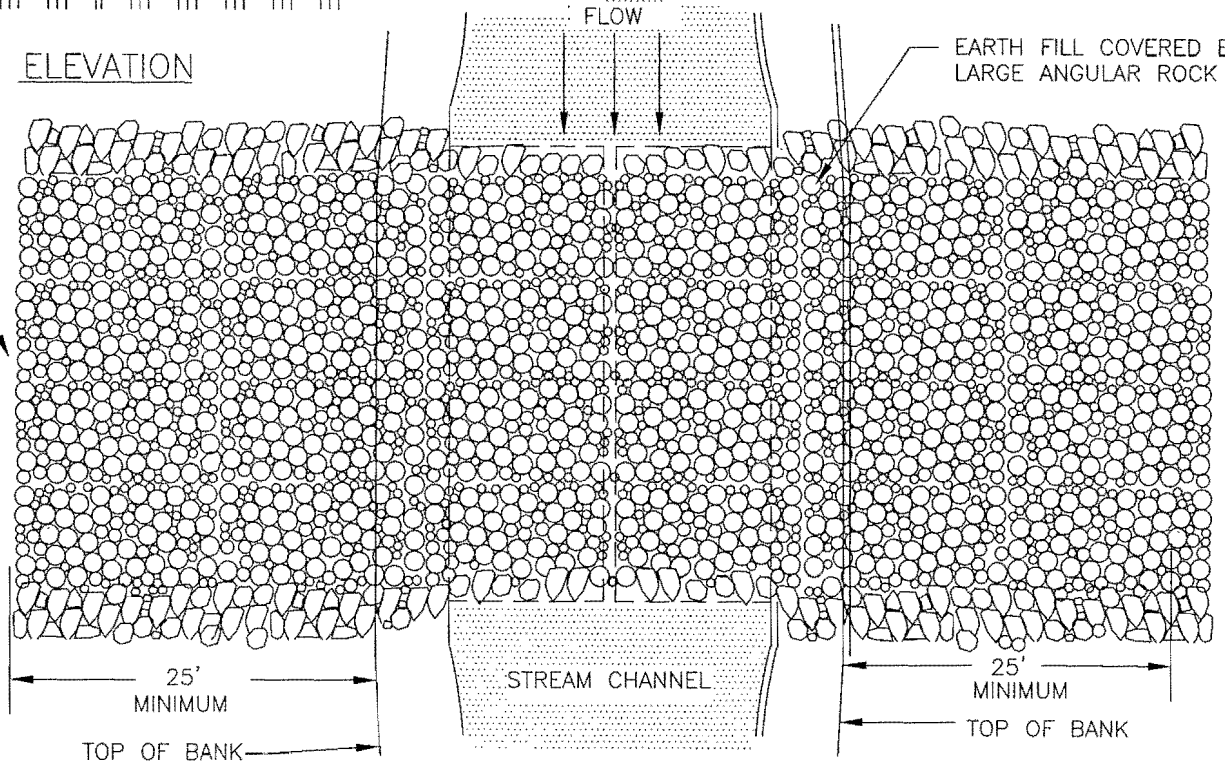


CAPACITY OF PIPE CULVERTS
TOGETHER = BANK FULL FLOW

ELEVATION

COARSE AGGREGATE

EARTH FILL COVERED BY
LARGE ANGULAR ROCK



SMITHFIELD
NORTH CAROLINA



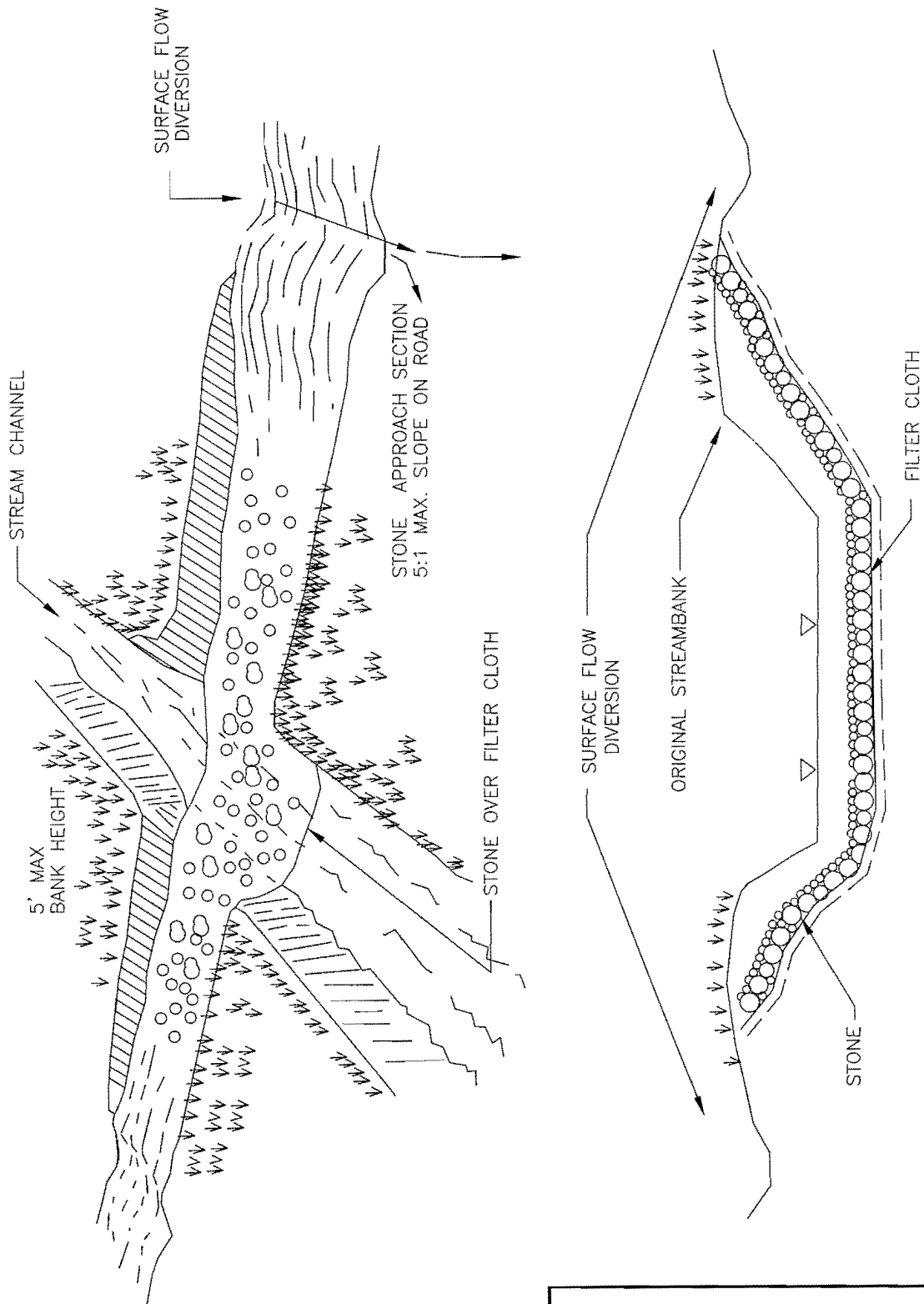
STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Temporary Stream Crossing

Drawing
0411A

Date

1/12/2000



SMITHFIELD NORTH CAROLINA

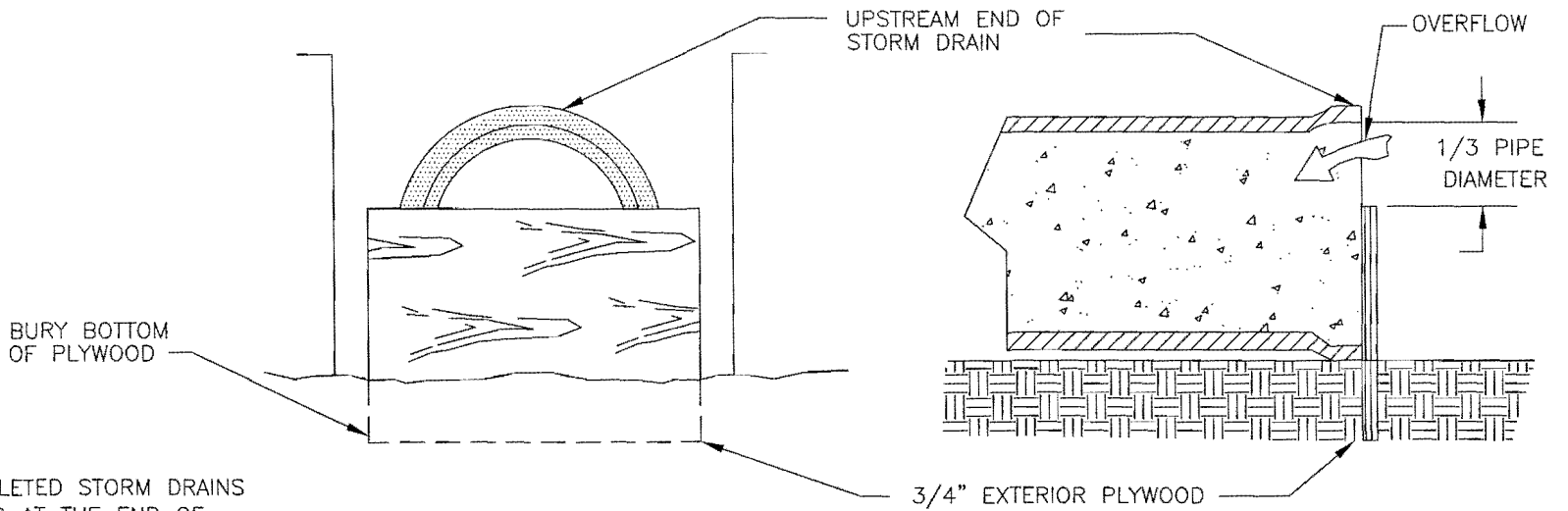


STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Drawing
0411B

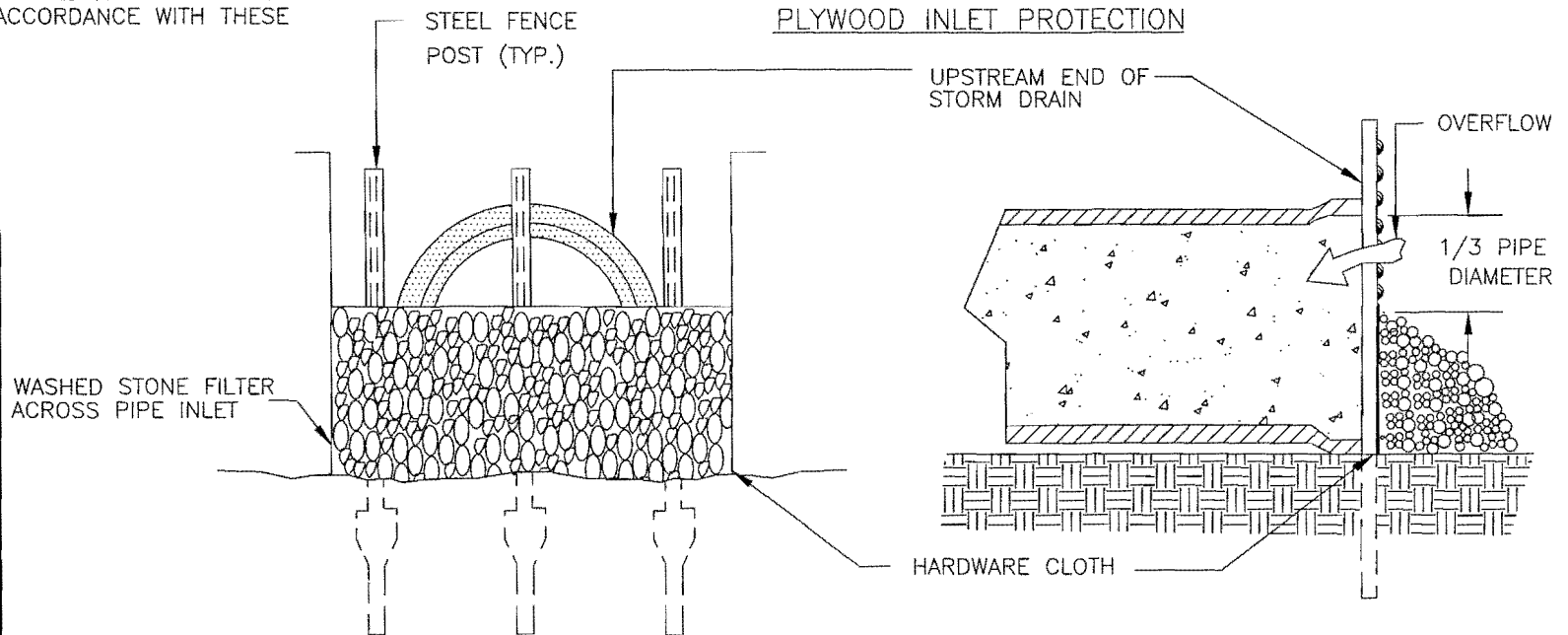
Temporary Stream Crossing Option

Date
1/12/2000



NOTE: ALL PARTIALLY COMPLETED STORM DRAINS SHALL BE PROTECTED AT THE END OF EACH DAY IN ACCORDANCE WITH THESE DETAILS.

PLYWOOD INLET PROTECTION

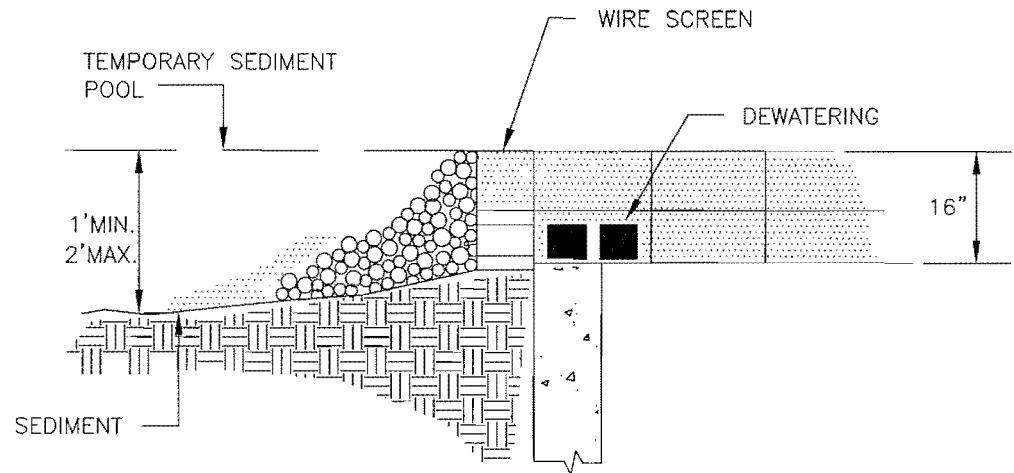
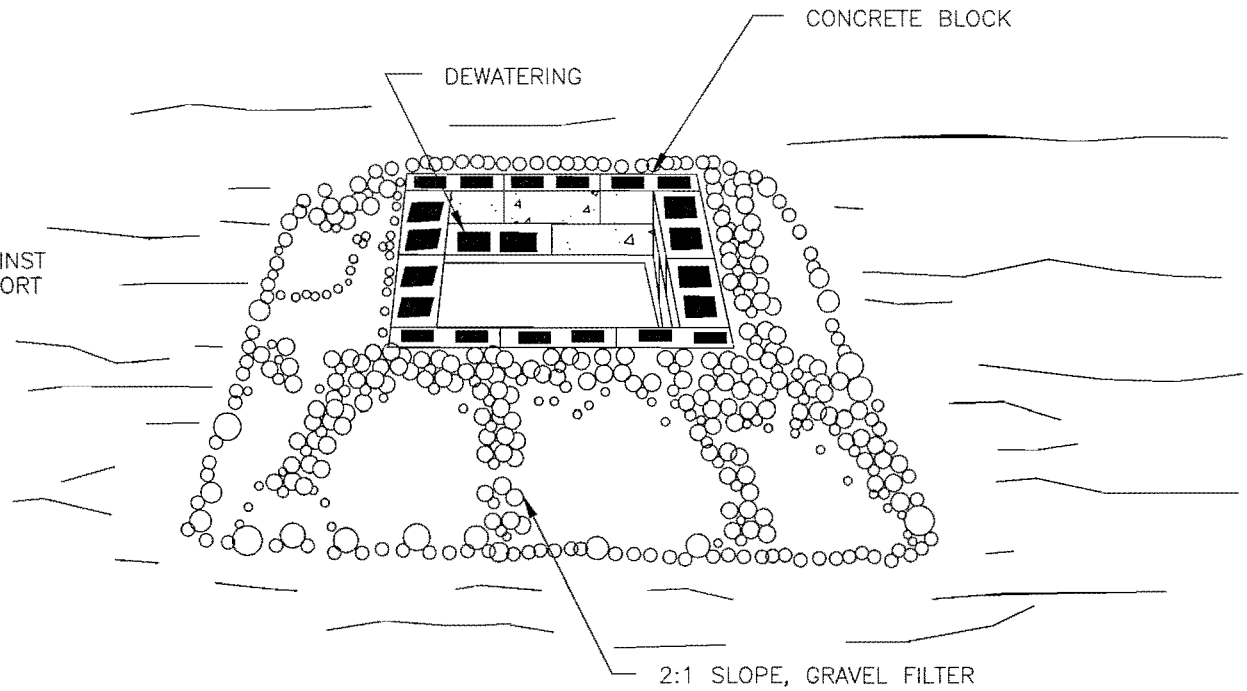


STONE FILTER INLET PROTECTION

Pipe Inlet Protection (Plywood and Stone)	STANDARD DETAIL AND SPECIFICATIONS MANUAL	
	Drawing 0412	
Date 1/12/2000		

CONSTRUCTION SPECIFICATIONS

1. LAY ONE BLOCK ON EACH SIDE OF THE STRUCTURE ON ITS SIDE ON THE BOTTOM ROW TO ALLOW POOL DRAINAGE. THE FOUNDATION SHOULD BE EXCAVATED AT LEAST 2 INCH BELOW THE CREST OF THE STORM DRAIN. PLACE THE BOTTOM ROW OF THE BLOCK AGAINST THE EDGE OF THE STORM DRAIN FOR LATERAL SUPPORT AND TO AVOID WASHOUTS WHEN OVERFLOW OCCURS. IF NEEDED, GIVE LATERAL SUPPORT TO SUBSEQUENT ROWS BY PLACING 2x4 WOOD STUDS THROUGH BLOCK OPENINGS.
2. CAREFULLY FIT HARDWARE CLOTH OR COMPARABLE WIRE MESH WITH 1/2-INCH OPENING OVER ALL BLOCK OPENING TO HOLD GRAVEL IN PLACE.
3. USE CLEAN GRAVEL, 3/4- TO 1/2-INCH IN DIAMETER, PLACED 2 INCHES BELOW THE TOP OF THE BLOCK ON A 2:1 SLOPE OR FLATTER AND SMOOTH IT TO AN EVEN GRADE. DOT #57 WASHED STONE IS RECOMMENDED.



SMITHFIELD
NORTH CAROLINA

STANDARD DETAIL AND
SPECIFICATIONS MANUAL

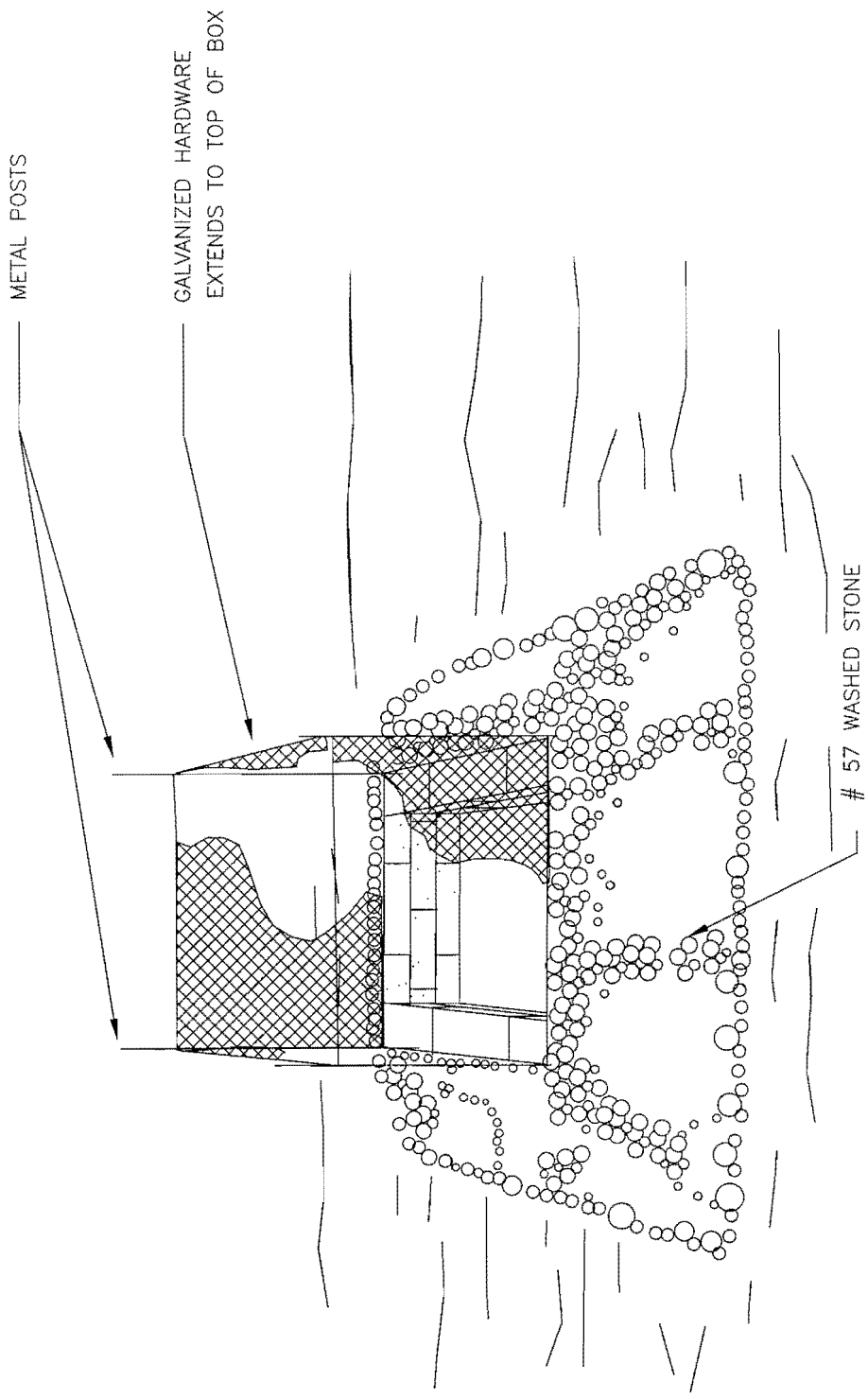
Block and Gravel Drop Inlet Protection



Drawing
0413

Date

1/12/2000



SMITHFIELD NORTH CAROLINA



STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Drawing
0414

Standard Catch Basin / Yard
Inlet Protection

Date
1/12/2000

TABLE 4.1
 SHOULDERS, SIDE DITCHES, SLOPES
 (MAX. 3:1)

DATE	TYPE	PLANTING RATE
AUG 15– NOV 1	TALL FESCUE	300 LBS/ACRE
NOV 1– MAR 1	TALL FESCUE AND ABRUZZI RYE	300 LBS/ACRE
MAR 1– APR 15	TALL FESCUE	300 LBS/ACRE
APR 15– JUNE 30	HULLED COMMON BERMUDAGRASS	25 LBS/ACRE
JULY 15– AUG 15	TALL FESCUE <u>AND</u> ***BROWNTOP MILLET	35 LBS/ACRE

CONSULT SOIL CONSERVATION SERVICE FOR ADDITIONAL INFORMATION CONCERNING OTHER ALTERNATIVES FOR VEGETATION OF DENUDED AREAS. THE ABOVE VEGETATION RATES ARE THOSE WHICH DO WELL UNDER LOCAL CONDITIONS; OTHER SEEDING RATE COMBINATIONS ARE POSSIBLE

***TEMPORARY - RESEED ACCORDING TO OPTIMUM SEASON FOR DESIRED PERMANENT VEGETATION. DO NOT ALLOW TEMPORARY COVER TO GROW OVER 12 INCHES IN HEIGHT BEFORE MOWING, OTHERWISE FESCUE MAY BE SHADED OUT.


Shoulders, Side Ditches, Slopes	Table 4.1
	STANDARD DETAIL AND SPECIFICATIONS MANUAL
	
Date	Drawing
1/12/2000	Table 4.1


TABLE 4.2
 SHOULDERS, SIDE DITCHES, SLOPES
 SLOPES (3:1 TO 2:1)

DATE	TYPE	PLANTING RATE
MARCH 1– JUNE 1	SERICEA LESPEDEZA (SCARIFIED)	50 LBS/ACRE
MARCH 1– APRIL 15	<u>AND</u> ADD TALL FESCUE	120 LBS/ACRE
MARCH 1– JUNE 30	<u>OR</u> ADD WEeping LOVEGRASS	10 LBS/ACRE
MARCH 1– JUNE 30	<u>OR</u> ADD HULLED COMMON BERMUDAGRASS	25 LBS/ACRE
JUNE 1– SEPTEMBER 1	***TALL FESCUE <u>AND</u> ***BROWNTOP MILLET *** <u>OR</u> SORGHUM–SUDAN HYBRIDS	120 LBS/ACRE 25 LBS/ACRE 30 LBS/ACRE
SEPTEMBER 1– MARCH 1	SERICEA LESPEDEZA (UNHULLED–UNSCARIFIED) <u>AND</u> TALL FESCUE ADD ABRUZZI RYE	70 LBS/ACRE 120 LBS/ACRE 25 LBS/ACRE

CONSULT SOIL CONSERVATION SERVICE FOR ADDITIONAL INFORMATION CONCERNING OTHER ALTERNATIVES FOR VEGETATION OF DENUDED AREAS. THE ABOVE VEGETATION RATES ARE THOSE WHICH DO WELL UNDER LOCAL CONDITIONS; OTHER SEEDING RATE COMBINATIONS ARE POSSIBLE

***TEMPORARY – RESEED ACCORDING TO OPTIMUM SEASON FOR DESIRED PERMANENT VEGETATION. DO NOT ALLOW TEMPORARY COVER TO GROW OVER 12 INCHES IN HEIGHT BEFORE MOWING, OTHERWISE FESCUE MAY BE SHADED OUT.

Shoulders, Side Ditches, Slopes	Table 4.2	STANDARD DETAIL AND SPECIFICATIONS MANUAL	SMITHFIELD NORTH CAROLINA



**SECTION 5.00
PIPE TRENCHES**

5.01 EXCAVATION AND PREPARATION OF PIPE TRENCHES

Trenches for water distribution lines, sanitary sewer lines, force mains, and storm sewer lines shall be excavated to the required depth to permit installation of the pipe along the lines and grades shown on the construction drawings. The minimum trench width at the top of the pipe shall be at least 18 inches greater than the outside diameter of the pipe. Where excavation is in rock, the rock shall be removed to a depth of at least 6 inches below grade and shall be backfilled with materials in accordance with these specifications. Wet trenches shall be stabilized with #78 M stone or with a base layer of #57 stone.

5.02 PIPE LAYING AND BACKFILLING

All pipe shall be laid in accordance with the manufacturer's recommendations. The subgrade at the bottom of the trench shall be shaped to secure uniform support throughout the length of the pipe. A space shall be excavated under the bell of each pipe to provide space to relieve bearing pressure on the bell and to provide room to adequately make the joint. Open ends of pipe shall be plugged with a standard plug or cap at all times when pipe laying is not in progress. Trench water shall not enter the pipe. Backfill material shall be free from construction material, debris, frozen material, organic material, or unstable material. The top 2 feet of backfill material shall be free from stones greater than 4 inches in diameter.


Under roadways and extending at a slope of 1 to 1 beyond the back of curb, measured perpendicular from centerline, backfill shall be compacted to a density of no less than 95% standard Proctor maximum dry density as measured by AASHTO method T99. Backfill shall be placed in lifts of 8 inches or less of the uncompacted soil. Other fill material shall be compacted to a density of no less than 90% of the maximum dry density as measured by AASHTO method T99. Backfill material shall be placed in lifts of 12 inches or less of the uncompacted soil. Suitable backfill material shall be utilized and compacted in accordance with Town compaction requirements and the pavement repair shall be in accordance with Standard Detail 5.01.

All trenches shall be properly backfilled at the end of each working day. All pavement cuts shall be repaired within a maximum of three (3) days from the date the cut is made. If conditions do not permit a permanent repair within the given time limit, permission to make a temporary repair must be obtained from the Town Engineer.

In locations where backfill material is temporarily stockpiled on the roadway surface, a layer of 1 1/2 inches of screenings shall be used between the pavement surface and the backfill material.

5.03 BORING AND JACKING

All crossings of Town streets shall be by bore and jack method in order to minimize pavement cuts and maintenance problems. The Town shall recommend that all crossings of State maintained streets within the Town corporate limits be by the bore and jack method. In cases where circumstances such as utility conflicts will not allow crossing by bore and jack method, the Town may consider approving other methods of crossing with additional requirements to minimize pavement failure and maintenance problems.

SMITHFIELD NORTH CAROLINA		
STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing SPEC5_1	
SECTION 5.00 PIPE TRENCHES	Date 2/1/2000	

In locations where open pipe trenches are not allowed, dry bore and jack operations may be allowed. Smooth wall or spiral welded steel pipe may be jacked through dry bores slightly larger than the pipe bored progressively ahead of the leading edge of the advancing pipe. The spoil material shall be mucked by the auger back through the pipe during the boring operation. As dry boring new section of the encasement pipe shall be butt-welded to the section progresses, each previously jacked into place.

The steel pipe shall be manufactured of grade 'B' steel with a minimum yield strength of 35,000 psi in accordance with ASTM A139 and A283. When used along or under a roadway maintained by NCDOT, the encasement pipe shall be coated to meet NCDOT requirements.

If voids are encountered while installing encasement pipe thirty (30) inches and larger, grout holes shall be installed at ten (10) foot centers and filled with 1:3 Portland cement grout at sufficient pressure to prevent settlement of the roadway, unless NCDOT approval stipulates otherwise. Other grout mixtures may be submitted for approval.

In the event that an obstruction is encountered during the boring and jacking operation, the auger is to be withdrawn and the excess pipe is to be cut off, capped, and filled with 1:3 portland cement grout at a sufficient pressure to fill all voids before moving to another boring site.

Size and wall thickness of smooth wall or spiral welded encasement pipe shall be as follows:



<u>Pipe Size (O.D.)</u>	<u>Wall Thickness (in.)</u>
12 3/4"	0.188
16"	0.250
18"	0.250
20"	0.250
24"	0.250
30"	0.312
36"	0.375

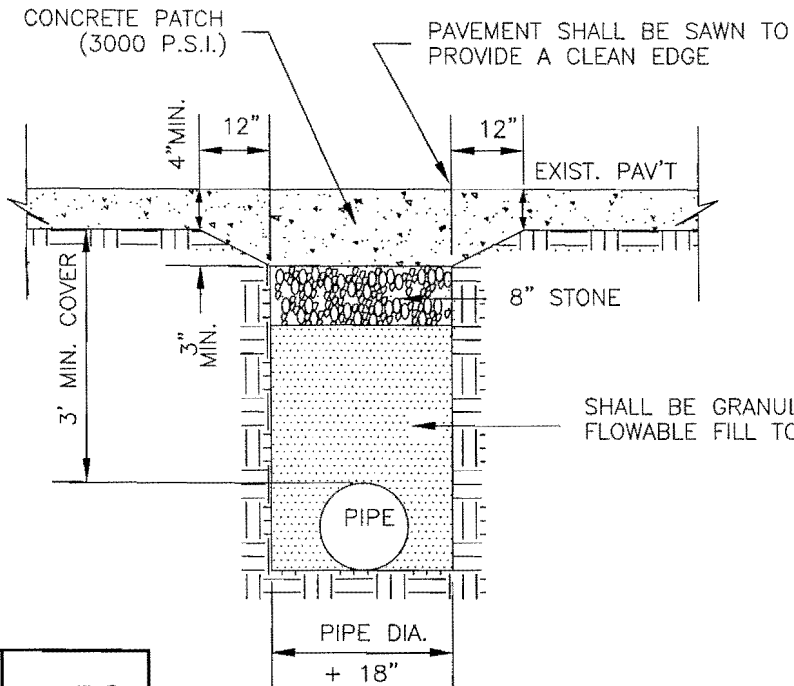
Casing pipe shall be installed with a minimum cover of 3 feet under pavement.

All carrier pipe shall be slip joint ductile iron pipe resting on treated timber skids as shown on Standard Detail 5.02 so as to prevent damage to the pipe bell. Pipe bells shall not contact the interior of the casing pipe. No blocks or spacers shall be wedged between the pipe and the top of the casing. Casing pipe shall have the following minimum sizes:

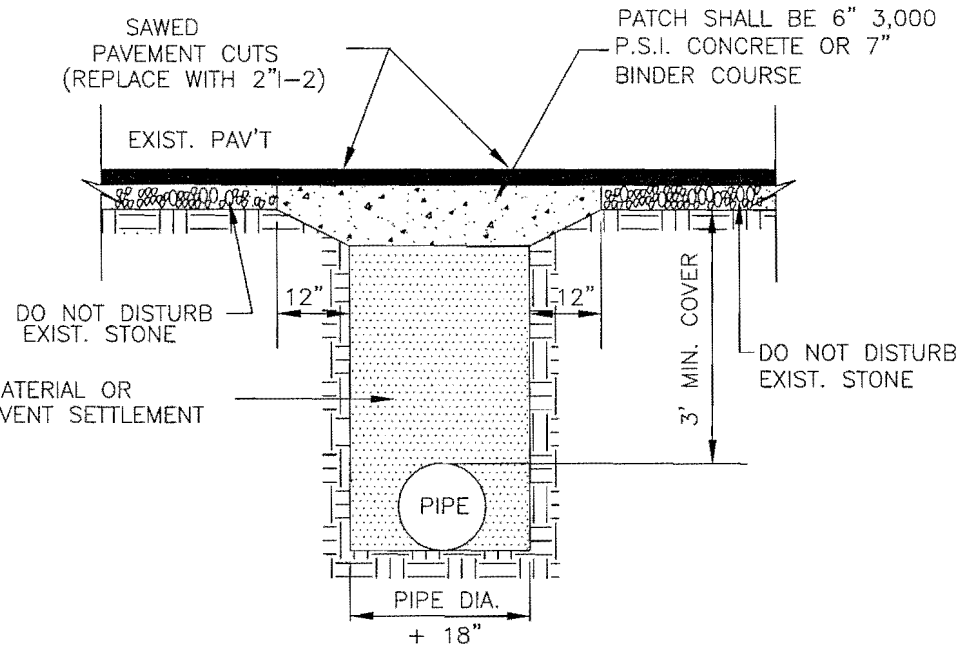
<u>Carrier Pipe Size (in)</u>	<u>Casing Pipe Size (in)</u>
4	12 3/4
6	12 3/4
8	18
10	20
12	24
14	26
16	28

END OF SECTION 5.00

 	
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CONCRETE PAVEMENT



ASPHALT PAVEMENT

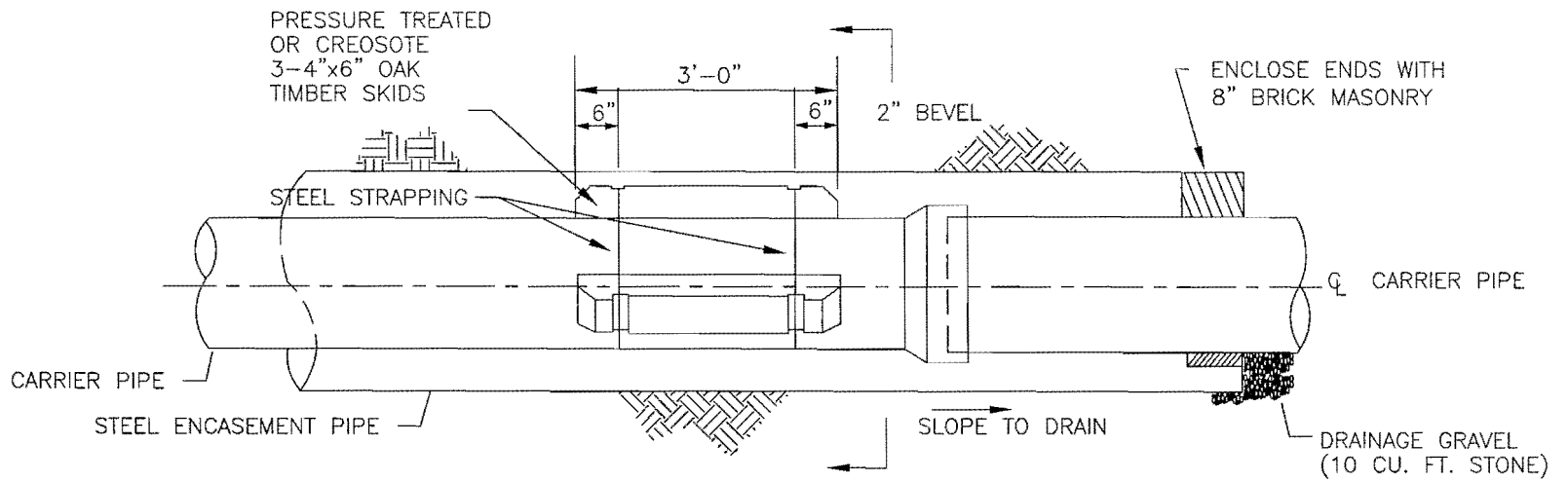
NOTE TO CONTRACTOR:

ALL PAVEMENT CUTS SHALL BE REPAIRED WITHIN A MAXIMUM OF THREE (3) DAYS FROM THE DATE THE CUT IS MADE. IF CONDITIONS DO NOT PERMIT A PERMANENT REPAIR WITHIN THE GIVEN TIME LIMIT, PERMISSION TO MAKE A TEMPORARY REPAIR MUST BE OBTAINED FROM THE DIRECTOR OF PUBLIC WORKS.

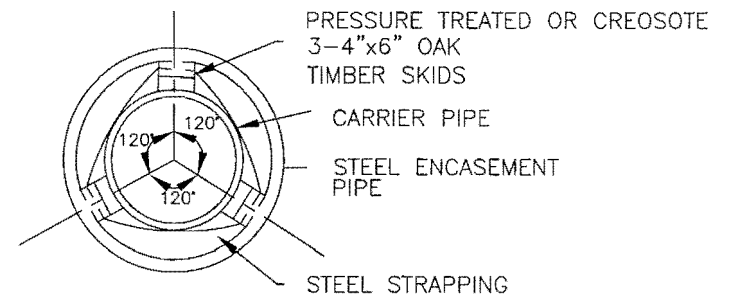
CONCRETE TRENCH CAP ON ASPHALT STREETS SHALL BE USED ONLY DURING INCLEMENT WEATHER WHEN ASPHALT PLANTS ARE NOT OPERATING.

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ELEVATION

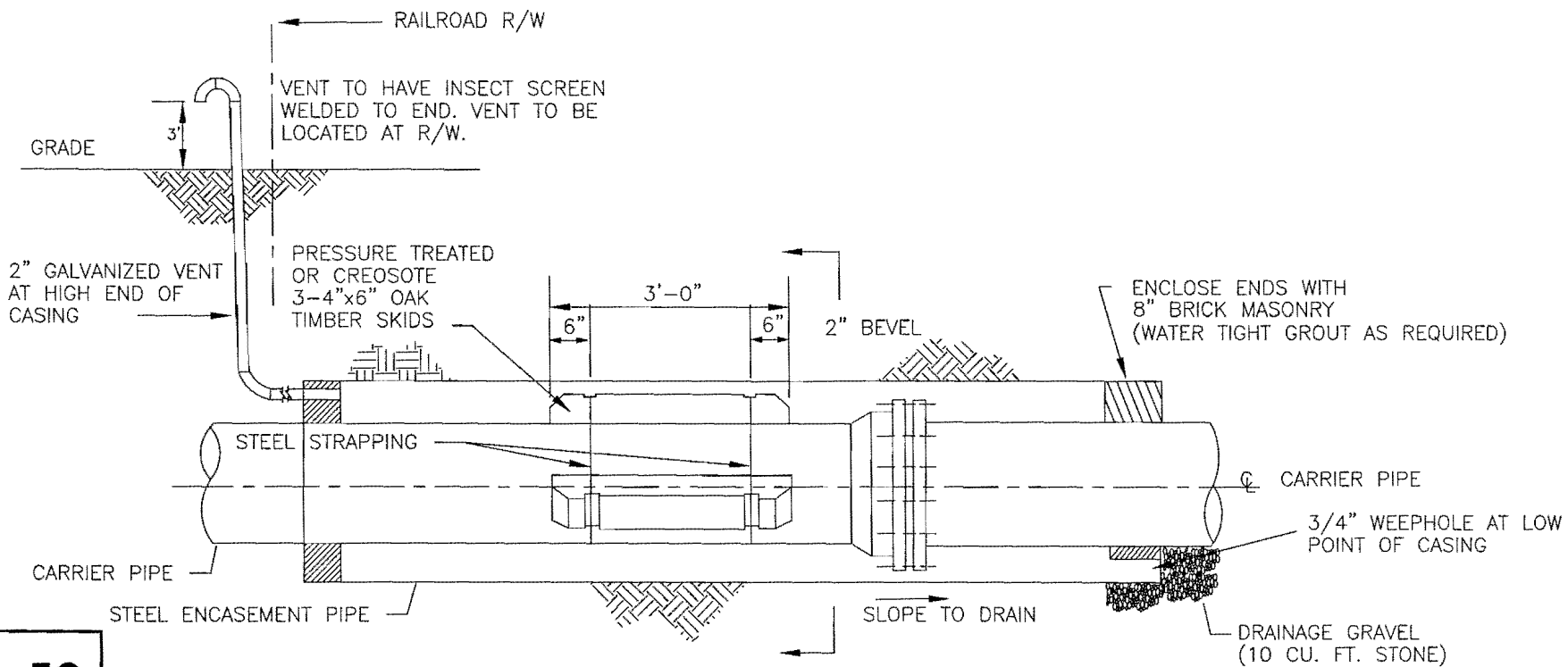


SECTION

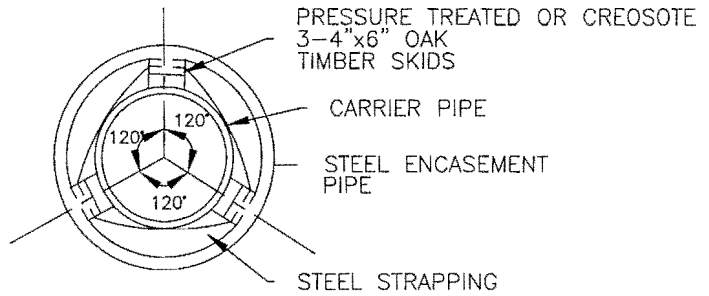
NOTES:

METAL "SPIDERS" MAY BE USED FOR SUPPORT OF THE CARRIER PIPE WITHIN THE CASING PIPE.

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Carrier Pipe	



ELEVATION



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Carrier Pipe—Under Railroad	STANDARD DETAIL AND SPECIFICATIONS MANUAL	SMITHFIELD NORTH CAROLINA	

**SECTION 8.00
STORM DRAINAGE**

8.01 STORM DRAINAGE MATERIALS

A. Pipe Materials

1. Reinforced Concrete Pipe shall be as per ASTM C76, Table III or Table IV with a minimum 12 inch inside diameter. Joints shall be sealed with a plastic cement putty meeting Federal Specification SS-S-00210, such as Ram-Nek or a butyl rubber sealant.
2. Corrugated Steel Pipe or Pipe-Arch shall have a minimum 12 inch nominal diameter and conform to AASHTO M36 with pipe ends having no less than 2 round corrugations on each end. Bands for connecting pipes shall be corrugated with a minimum of 2 corrugations for each pipe. Pipe shall be fully bituminous coated with an asphalt paved invert in accordance with the requirements of AASHTO M190 for Type C pipe.
3. ADS N-12 High Density Polyethylene Corrugated Storm Sewer Pipe shall have a minimum 12 inch nominal diameter and shall be used only in areas outside of public right of way. ADS pipe shall not be installed under any pavement or curb and gutter, and shall be installed with Class I or Class II bedding to the spring line of the pipe. Pipe material shall meet the product specifications of ASTM F667 and shall have a smooth interior.

B. Structure Materials

All storm drainage structures such as manholes, inlets, junction boxes and catch basins shall be constructed of either solid brick, solid block, or precast concrete.

1. Clay Brick shall be solid, rough, sound clay brick conforming to ASTM C32, Grade MS. The brick shall be laid with full shove joints, filling up the joints with mortar. The thickness of the joints shall not exceed 3/8 of an inch.
2. Concrete Block or brick shall be solid and conform to ASTM C139 as to design and manufacture. The block or brick shall be embedded in a mortar bed to form a 1/2 inch mortar joint.
3. Precast Concrete Manholes shall meet ASTM C478 as to design and manufacture. All manhole cones shall be the eccentric type. Manhole joints shall be sealed with a plastic cement putty meeting Federal Specification SS-S-00210, such as Ram-Nek or a butyl rubber sealant.
4. Manhole Frames and Covers shall be cast iron or ductile iron with "Storm Sewer" stamped on the cover and two 1 inch holes. Castings shall be machined to give even and continuous bearing on the full length of the frame. Castings shall be free of porosity and blow holes, and shall receive one coat of Koppers Super Service Bitumastic black paint. Paint shall be kept off of bolt threads, and surfaces shall be thoroughly wire brushed before painting. All manhole rings in roadways shall be installed in accordance with Standard Detail 7.08.

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5. Manhole Steps shall be of polypropylene material reinforced with a 1/2 inch diameter reinforcing rod. They shall be designed for a vertical load of 400 pounds and a horizontal pullout load of 1000 pounds, and shall be set 16" on center. Holes for the installation of manhole steps shall not project through the manhole wall, but shall stop a minimum of one inch from the outside wall. Steps shall be at least 10 inches clear width and shall project at least 4 inches from the wall into which they are embedded. Steps in precast concrete structures shall be installed by the manufacturer.
6. Catch Basins (curb inlets) for street drainage shall be in accordance with Standard detail 8.03 or 8.04. Precast concrete boxes are allowed, but precast manholes are not acceptable for use as catch basins.
7. Headwalls and Endwalls may be cast in place per NCDOT Standard Details 838.01 through 838.75, or precast with wing walls and apron by an approved manufacturer. Installation of precast headwalls and endwalls shall be in accordance with the manufacturer's recommended installation procedures and specifications.

8.02 STORM SEWERS

A. Location

1. All public storm sewers shall be installed in dedicated street right of way or dedicated easements. Minimum widths of storm sewer easements shall be 20 feet for pipes up to and including 48 inches in diameter and 30 feet for pipes greater than 48 inches in diameter.
2. See Sections 6.00 and 7.00 for horizontal and vertical separation requirements between storm drainage pipe, water lines, and sanitary sewer lines.
3. The Town of Smithfield shall maintain only the storm sewer systems within Town maintained rights of way and on Town owned property. Storm drainage systems located on private property shall be maintained by the property owner(s).
4. Unless prevented by topographic constraints, storm sewer shall not discharge into front yards of lots, but shall extend to within 20 feet of the rear property line in lots up to 1/2 acre in size and shall extend a minimum of 150 feet from right of way in lots larger than 1/2 acre.

B. Sizing and Design

1. Storm sewer systems shall be designed on the basis of the 2 year storm for inlet spacing, the 10 year storm for street drainage pipe sizing, the 25 year storm for cross-street drainage, and the 100 year storm for flood plain areas. Pipes shall be designed to flow 7/8 full.
2. Runoff rates shall be calculated by the Rational Method, SCS Method, or other acceptable procedure. Runoff computations shall be based on rainfall data published by the National Weather Service for this area.
3. For drainage areas less than 2 square miles, the Rational Method is recommended to calculate runoff. For drainage areas greater than 2 square miles, the SCS Method or other recognized method is recommended.

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4. Time of concentration (tc) shall be appropriate for the drainage area in question using Kirpich Equation (Bureau of Reclamation, 1974, p.71).
5. Storm duration shall equal the time of concentration (tc).
6. Storm sewer pipe shall be sized in accordance with the Manning Equation.
7. Storm sewers shall be designed to provide a velocity of at least 2 feet per second at design flow.
8. The minimum pipe diameter shall be 12 inches where the inlet is grated and 15 inches where the inlet is not grated.

C. Installation

1. All storm sewers shall be installed to provide a true line and grade between structures.
2. Structures shall be installed at each deflection of line and/or grade.
3. The maximum length between access points shall be 400 feet for all pipe sizes.
4. No inaccessible storm drainage structures shall be allowed.
5. Pipe may enter through the corner of all structure material types except precast concrete "waffle" boxes.
6. A reinforced concrete slab designed by an engineer may be used at oversized structures to adjust an inlet to standard dimensions.
7. The minimum cover for storm sewer pipe shall be 2 feet to finished subgrade under roads and 1 foot to finished grade under nonload-bearing areas. Trench excavation and backfilling shall be in accordance with Section 5.00 of these specifications.
8. Pipe shall not project into a drainage structure but shall be finished flush with the inside of the structure.
9. Catch basins between 5 and 20 feet in depth shall have minimum interior dimensions of 4 feet by 4 feet, and those over 20 feet in depth shall have minimum interior dimensions of 5 feet by 5 feet.
10. Each drainage structure shall have a shaped invert constructed from concrete, and a bench with a maximum 5:1 slope. The bench shall begin at a height of one-half the pipe diameter for 12 to 24 inch pipe, one-third the pipe diameter for 30 to 48 inch pipe, and one-fourth the diameter for pipe greater than 48 inches in diameter.
11. Precast concrete structures may be installed only to depths certified as acceptable by the manufacturer.

D. Pipe Inlets and Outlets

1. Headwalls, endwalls or flared end sections shall be installed at all inlets and discharge points.

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2. Flared end sections shall be installed on single pipe culverts up to and including 60 inches in diameter, and on multiple pipe culverts up to and including 36 inches in diameter.
3. Headwalls and endwalls shall be installed on single pipe culverts greater than 60 inches in diameter, and on multiple pipe culverts greater than 36 inches in diameter.
4. Precast headwalls shall only be installed at single pipe culverts.
5. Energy dissipators shall be installed at all discharge points and shall be properly sized to ensure that stormwater is released at a nonerosive velocity.
6. A fabric or washed stone barrier shall be installed between the dissipation pad and the natural ground.
7. The stormwater design shall include scour protection for the drainage way.
8. Storm drainage channels and ditches shall be designed to carry the design flow at nonerosive velocities. Calculations indicating design velocities shall be provided along with typical channel cross-sections. The maximum allowable design velocity in grass channels is 4 feet per second.
9. The Town may require additional information on the impact of stormwater discharge on adjacent properties.

E. Street Drainage

1. Stormwater shall not be allowed to flow across streets at intersections. Drainage structures shall be provided to intercept flow prior to the radius of intersections or the street design shall provide for a continuous grade around the radius to channel flow down the intersecting street.
2. No stormwater inlets shall be placed within travel areas of a roadway or parking lot.
3. Curb inlets shall be designed to intercept stormwater before the gutter spread exceeds 8 feet for the 2 year storm. In areas of heavy pedestrian traffic, the maximum allowable spread may be decreased by the Town Engineer.

8.03 STORMWATER IMPOUNDMENTS

Stormwater Impoundments, where required, shall meet the following criteria:

Retention (wet) facilities shall be utilized where the upstream drainage area is ten (10) acres or greater unless otherwise approved by the Town. Detention (dry) facilities may be utilized where the upstream drainage area is less than ten (10) acres.

Retention (wet) facilities shall be designed in accordance with the Appendix of Section 8.00.

The following general guidelines should be followed when designing both retention and detention facilities:

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1. Side slopes shall be no steeper than 3:1 and no flatter than 10:1.
2. Both barrel and riser shall be concrete, and the riser shall be located in or near the embankment.
3. The riser inlet shall be covered with a trash rack to prevent clogging.
4. The principle spillway shall be designed for 10 year predevelopment storm; the emergency spillway shall be designed for the 100 year storm.
5. The minimum length to width ratio shall be 2:1; The maximum length to width ratio shall be 5:1 unless otherwise approved by this Town.
6. A maintenance access to and around the perimeter of the facility shall be provided via a minimum fifteen (15) foot wide gravel road adequate to withstand heavy equipment. The access road shall not cross the emergency spillway, and shall have a maximum slope of 5:1.
7. On-site disposal areas capable of receiving sediment from at least two (2) clean-out cycles should be reserved in adjacent open space, if available.
8. All inflow points and outlet channels shall be protected by appropriately designed velocity dissipators.
9. Embankments shall allow for a minimum one (1) foot freeboard.
10. Anti-seep collars shall be installed around the barrel and a core trench shall be installed under the embankment to key it to the substrate.
11. Such facilities shall not be used as erosion control devices during construction except as approved by the Town.
12. The Town shall receive, for all stormwater impoundments, design calculations including, but not limited to, hydrographs, routing and outlet sizing, and a maintenance plan and schedule for sediment removal and disposal.

END OF SECTION 8.00

**SECTION 8.00
APPENDIX**

The following text is derived from a technical paper by the North Carolina Department of Environmental Management. The content of the paper has been revised for this Appendix to more specifically address requirements of the Town of Smithfield.

 	
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AN OVERVIEW OF WET DETENTION BASIN DESIGN

The design of wet detention basins is based on retaining the runoff from a storm for an extended length of time in order to settle out suspended solids and pollutants (such as heavy metals and nutrients). Biological treatment also occurs. Driscoll's model was chosen for the permanent pool water quality component of the design. The model uses as input a long-term average storm statistically calculated from the historical rainfall record. By using this storm and the appropriate watershed characteristics (e.g., impervious cover), a permanent water quality pool is sized to detain the runoff long enough to attain the target total suspended solids (TSS) removal. The model incorporates settling that occurs during the storm (dynamic) and between storms (quiescent). The movement of the storm runoff through the basin is assumed to be via plug flow. In general, the Town requires 85% TSS removal in basins designed for the long-term average piedmont storm. This may be achieved by detaining runoff from the first 1-inch of rainfall for not less than two (2) days and not more than five (5) days.

In addition to the permanent water quality pool, the basin should have a temporary water quality pool for extended detention. This temporary water quality storage, located above the permanent pool, is necessary for periods when runoff entering the basin is significantly warmer than the permanent water quality pool. During these periods, a thermocline is established, plug flow does not occur and runoff exits the basin without being detained long enough to achieve maximum settling. To counteract this lack of detention time and settling, the runoff (from the 1-inch storm) should be slowly released through a negatively sloped pipe.

Once the minimum surface area and temporary storage volume of the basin needed to achieve the stated water quality goals are determined, the principal outlet and emergency spillway may be sized for flood or erosion control. The storage allocated to flood control is located on top of both water quality pools, while the storage for erosion control occupies the same storage as the temporary water quality pool (Figure 1).

The wetted perimeter of the basin should be planted with aquatic vegetation. This vegetation not only enhances pollutant removal but provides wildlife and waterfowl habitat, and protects the shoreline from erosion.

The Basins should be sized for the entire contributing area including offsite drainage. In general, instream impoundments should not be installed in order to avoid sizing the storage for the entire upstream watershed. If a development encompasses the entire upper part of a drainage area, then locating the basin in the streambed will not increase the required storage. If the development has offsite drainage flowing onto the site several basins may be utilized and sized for smaller drainage areas.

In addition to being properly designed, the basin must also be routinely maintained to satisfy long-term water quality goals. A key to any maintenance program is the allocation of adequate funding and the designation of the responsible party.

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**SURFACE AREA TO DRAINAGE AREA RATIO (SA/DA) FOR PERMANENT
POOL SIZING FOR 85% POLLUTANT REMOVAL EFFICIENCY**

TABLE 1

Impervious %	3.0	3.5	4.0	4.5	5.0	5.5	6.0
10	0.59	0.54	0.49	0.47	0.43	0.39	0.35
20	0.97	0.88	0.79	0.75	0.70	0.65	0.59
30	1.34	1.20	1.08	1.03	0.97	0.91	0.85
40	1.73	1.58	1.43	1.36	1.25	1.14	1.03
50	2.00	1.82	1.73	1.64	1.50	1.40	1.33
60	2.39	2.09	2.03	1.87	1.66	1.56	1.51
70	2.75	2.44	2.27	2.12	1.96	1.87	1.79

Using the Chart

The numbers in the chart represent surface area (SA) to drainage area (DA) percentages. SA=the wet detention pond permanent pool surface area required for 85% pollutant removal. The chart is based on the amount of impervious cover as a percentage of the area draining to the pond and the depth of the permanent pool of the pond. Impervious percentages are in the left hand column of the chart and depths are given across the table from 3 feet to 6 feet in half foot increments.

To determine the required permanent pool size use the following steps:

1. Calculate the percent impervious cover of the site draining to the pond (amount of impervious area/total site area).
2. Determine the permanent pool depth (or select a depth for comparison purposes).
3. Go to the above chart with the impervious percentage found in 1. Go across the chart at this impervious percentage until you are under the appropriate permanent pool depth and read the value in the table. The number in the chart is given as a percent (%). If your impervious percentage or pond depth is between one of the values given you can interpolate between values.
4. To determine the required surface area of the pond take the number from the chart, divide by 100 and multiply this number by the contributing drainage area.

For example: assume a 10 acre site with 3 acres of impervious cover.

1. % impervious = $3/10 = .30$ or 30%
2. Assume a 4 foot permanent pool depth
3. From the chart, with 30% impervious and 4 foot depth, the SA/DA ratio is given as 1.08.

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4. So the required surface area of the permanent pool is: $(1.08/100) * 10 = .108$ acres or 4,705 square feet.
5. The design runoff volume to be controlled must then be held in the pond above this permanent pool level.

DESIGN OF PERMANENT POOL DETENTION BASINS

A. Design For Water Quality Control

- a) For the permanent water quality pool, use basin surface area/drainage area (SA/DA) ratios for given levels of impervious cover and basin depths (Table 1).
- b) Average permanent water quality pool depths should be between 3 and 6 feet.
- c) Use impervious levels expected in the final stages of development.
- d) Locate the temporary water quality pool for extended detention above the permanent water quality pool. The orifice of the negatively sloped pipe should be sized to release runoff from the first 1-inch rainfall over a period between 48 to 120 hours.
- e) Basin shape should minimize dead storage areas: average length of flow to effective width > 2.0 .
- f) A forebay (may be established by a weir) should be included to encourage early settling. This allows drainage of only a portion of the basin in order to excavate accumulated sediment. The forebay volume should equal about 20% the basin volume (Figure 2).
- g) Check area ratios to make sure that the watershed will support a wet basin on existing soils.
- h) If the basin is used as a sediment trap during construction, make sure that all sediment deposited during construction is removed before normal operation begins.
- i) Aquatic vegetation should be included for a wetland type detention basin. A minimum 10 foot wide, one foot deep shelf is required around the edge of the basin for safety and to provide appropriate conditions for aquatic vegetation establishment. This shelf should be sloped 6:1 or flatter and extend out to a point 2 to 2.5 feet below the surface. A list of suitable wetland species and propagation techniques are provided in Schueler (1987) and Maryland DNR (1987). An emergency drain (with a pipe sized to drain the pond in less than 24 hours) should be installed in all ponds to allow access for riser repairs and sediment removal.

B. Design For Water Quantity

- a) Design Storm
 - 1) The primary outlet will most likely be designed for a 10-year storm. SCS suggests using the 24-hour storm.
 - 2) The emergency spillway should be designed for the 100-yr storm. The Dam Safety Act gives guidance on design storms for spillways in larger asins.

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- 3) Note that storms of other durations should be checked for overtopping.
- b) Peak Runoff Flow
- 1) Use the SCS method, or
 - 2) Use the Rational method, especially for watersheds less than 25 acres.

*Note: Care should be taken with either method to accurately calculate the Curve Number or Rational C. **If the SCS method for calculating the runoff produces less than 0.5 inches of runoff, an alternate method for calculating runoff shall be used.

- c) Volume of Runoff, Hydrograph Shape and Storage Required
- 1) Follow procedures in Malcom, et al., 1986, pp. 61–65, or
 - 2) Use SCS methods.
 - 3) Be sure to include a sediment storage pool in addition to the water quality and flood pools. Unfortunately there is only limited data on sediment yields from urban areas. A method outlined in Schueler (1987, pp. 1.9–1.20) may be used for predicting those sediment yields. See example 1–2 on page 2.19. In Piedmont areas, $(P) = 42$ inches per year and $(P_j) = 0.9$ (estimated). This calculation is for stabilized areas. The designer should keep in mind that this average sediment yield is at best an estimate of the actual sediment yield which is extremely dependent on such factors as soil type, slope and vegetative and stabilization practices. The designer would be prudent to overestimate sediment yield since more conservative (i.e., higher) sediment yield estimates will result in a larger allocated sediment storage and less frequent clean outs.

d) Stage–Storage Function for Basin

See Malcom and New, 1975, pp. 106–109.

e) Stage Discharge

- 1) See appropriate equations for outflow structures and when each equation is the limiting factor (Barfield, et al., 1981, pp. 227–236; Malcom and New, 1975, pp. 3–9 to 3–11), or
- 2) Use methods in Land Quality's Sediment Basin handout (NCDNRCD, land quality, 12/86, pg.5).

f) Emergency Spillway and Dam Height

- 1) Use SCS methods for emergency spillway design (Engineering Field Manual, USDA, SCS, 1986, Chapter 11; NCDNRCD, Land Quality, 12/86).
- 2) Include calculation for wave height and wind setup for a detailed freeboard analysis (Lindsley and Franzini, 1972, pp. 179–183).
- 3) Dams 15 feet or higher with an impoundment capacity of 10–acre–feet or greater at the top of the dam must obtain a Dam Safety permit from NCDNRCD, Land Quality.

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g) Storm Routing

- 1) Use either Storage Indication Method (Viessman, et al., 1977, pg. 240-244; Malcom and New, 1975, pp. 113-115; USDA, SCS, National Engineering Handbook, Sec. 4, Chapter 17), or
- 2) Use HRM (H.R. Malcom) method of routing which is easy to execute and approximates the Storage-Indication Method (Malcom and New, 1975, pp. 3-2 to 3-6, 110-113), or
- 3) Use SCS TR-20 method of routing.
- 4) The TR-55 routing method may be used for preliminary design (USDA, SCS, 1986, TR-55, pp. 7-6 to 7-13).

h) Downstream Protection

- 1) As required in the Sedimentation Control Plan (NCDNRCD, 8/1/85, Title 15, NCAC 4B.0009). The post-construction velocity of the 10-year storm runoff shall not exceed the greater of:
 - a) the maximum permissible velocity for the given channel lining,
 - b) the 10-year pre-development velocity.
- 2) Use methods in N.C. Division of Land Quality's Energy Dissipater handout (no date).
- 3) As mentioned in A(c) above, release the runoff from the first one-inch of rainfall over a 48 hour period for temporary water quality control. McCuen and Moglen's research (1987) as well as research reviewed by Schueler (1987) suggest that smaller storms are the key to controlling downstream streambank erosion. Schueler (1987) suggests that runoff from the first one-inch of rainfall released over 24-40 hours can reduce downstream erosion. Therefore the design and storage pool for erosion control shall be the same as that for the temporary water quality pool.

i) Construction of Basin and Dam

- 1) See SCS Technical Guideline #378-1, Ponds.
- 2) See guidelines in Dam Safety Act (NCDNRCD, 11/1/85) and SCS handbook (USDA, SCS, 1986, Chapters 11 and 17).
- 3) See estimated construction costs from the NURP project in Washington, D. C. (Metropolitan Washington COG, 1983, Chapter 3).

j) Other Design Considerations

- 1) To avoid clogging, barrels should be no smaller than 6 inches, risers no smaller than 8 inches, and reinforced concrete/concrete block structures no smaller than 24 x 24 inches (USDA, SCS, 1986, pg. 11-16).
- 2) An antivortex structure should be included (Florida DNR, 1984 draft, pg. 6-282.)
- 3) The barrel should be anchored to avoid flotation (Florida DER, 1984 Draft, pg. 6-282).
- 4) Facilities with a large amount of oil and grease should use an oil and grease skimmer.

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- 5) Stormwater should be routed via grassed waterways or pipes to the upper part of the basin to reduce short circuiting and obtain maximum detention time and settling.

C. Operation and Maintenance

Operation and maintenance shall be the responsibility of the developer or succeeding party in interest.

The Town reserves the right to perform periodic inspections of the Stormwater Control devices and may require maintenance to be performed if such a device or system is functioning improperly.

D. Location

- a) In order to avoid sizing the basin for the entire upstream drainage area, basins should be located out of the streambed and sized for smaller subbasins in the development. Particular care should be taken to modify storm drainage so that all developed areas drain to the basin especially if the site is intensively developed (e.g., condominium or commercial). This method will assure that all runoff from impervious areas will be treated, without the necessity of retreating upstream runoff.
- b) In newly developing areas of the watershed, a regional detention basin may be an option for the local government and developers to consider. Compensation and joint maintenance contracts between upstream and downstream property owners would probably be necessary.
- c) Buffers around the basin should be determined by the flood pool (usually the 100-year storm).

E. Certification

All basins should be designed, stamped, and certified that they are built as designed by a N. C. registered professional engineer.

Use the 1986 revised SCS TR-55.

F. Definitions

- 1) Forebay – The forebay is an excavated settling basin or a section separated by a low weir at the head of the primary impoundment. The forebay serves as a depository for a large portion of sediment and facilitates draining and excavating the basin.
- 2) Plug flow – Fluid particles which pass through the basin and are discharged in the same sequence in which they enter. The particles remain in the tank for a time equal to the theoretical detention time. This type of flow is especially appropriate for basins with high length-to-width ratios.
- 3) Primary outlet – The primary outlet is often constructed of a riser/barrel assembly and provides flood protection (i.e., for the 10-year storm) or reduces the frequency of the operation of the emergency spillway.

**SMITHFIELD
NORTH CAROLINA**



**STANDARD DETAIL AND
SPECIFICATIONS MANUAL**

Drawing
SPEC8_11

SECTION 8.00
STORM DRAINAGE

Date
2/1/2000

- 4) Emergency spillway – The emergency spillway is designed to discharge flow in excess of the principal spillway design discharge (i.e., safely pass the 100-year storm).
- 5) Impervious surface – Surfaces providing negligible infiltration such as pavement, buildings, recreation facilities, etc.

**SMITHFIELD
NORTH CAROLINA**

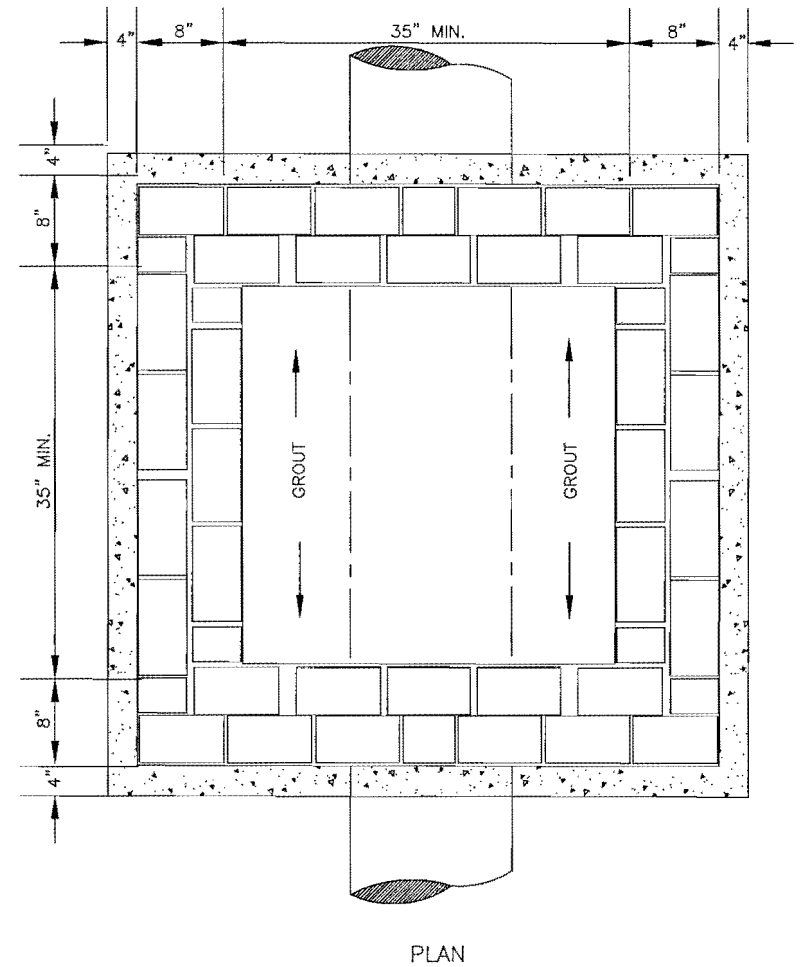
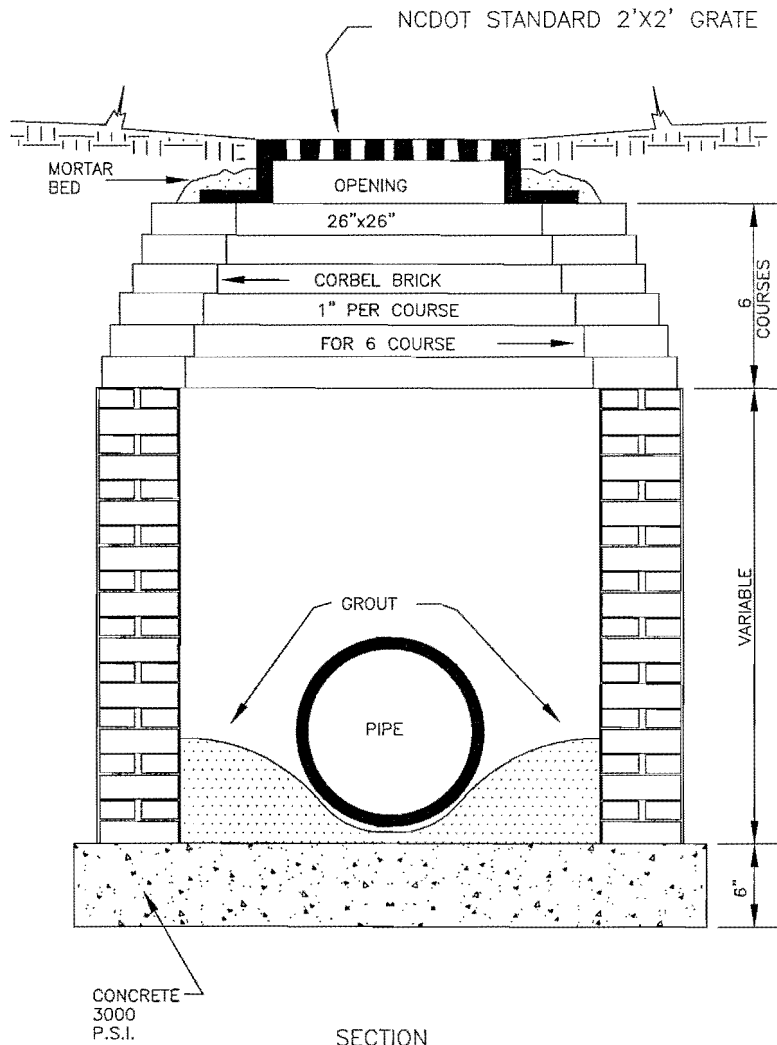


**STANDARD DETAIL AND
SPECIFICATIONS MANUAL**

Drawing
SPEC8_12

SECTION 8.00
STORM DRAINAGE

Date
2/1/2000




NOTES:

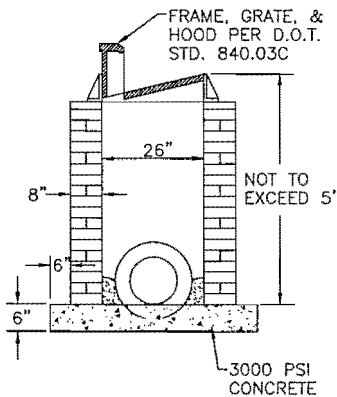
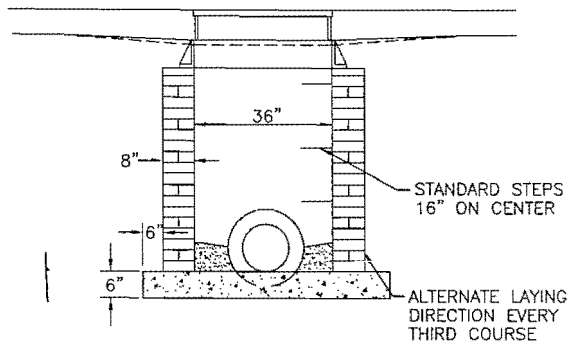
EITHER SOLID BRICK, SOLID BLOCK OR PRECAST CONCRETE MAY BE USED.

FOR 24" R.C.P. AND LARGER USE PIPE DIA. PLUS 12" FOR MINIMUM INSIDE DIMENSION.

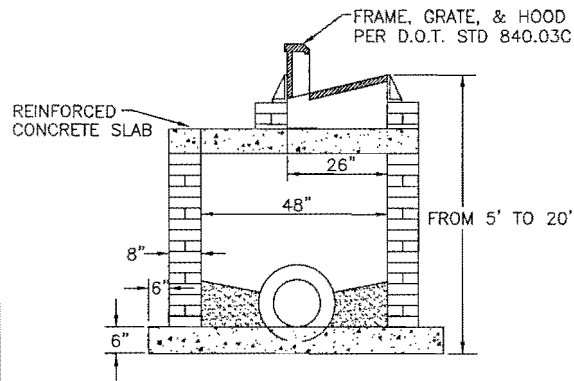
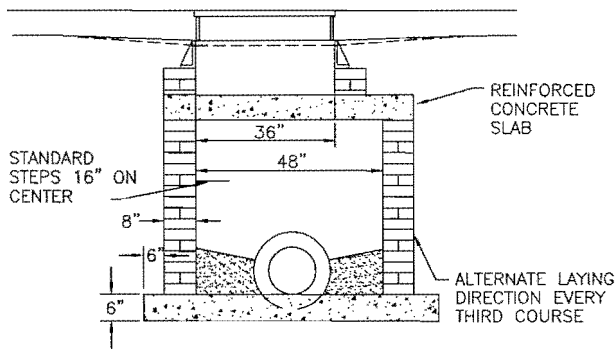
GRATED INLETS SHALL NOT BE USED WITHIN TRAVEL AREAS.
STANDARD STEPS REQUIRED @ 16" O.C. WHERE DEPTH EXCEEDS 3'.

<p>Standard Yard Inlet with Grate and Frame</p>	<p>STANDARD DETAIL AND SPECIFICATIONS MANUAL.</p>	<p>SMITHFIELD NORTH CAROLINA</p> 
	<p>Drawing 0802</p>	
<p>Date 1/17/2000</p>		

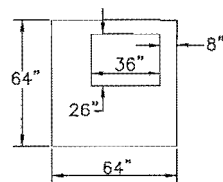
SHALLOW TYPE
(5 FEET OR LESS IN DEPTH)



INTERMEDIATE TYPE (4'X4')
(5 FEET TO 20 FEET IN DEPTH)

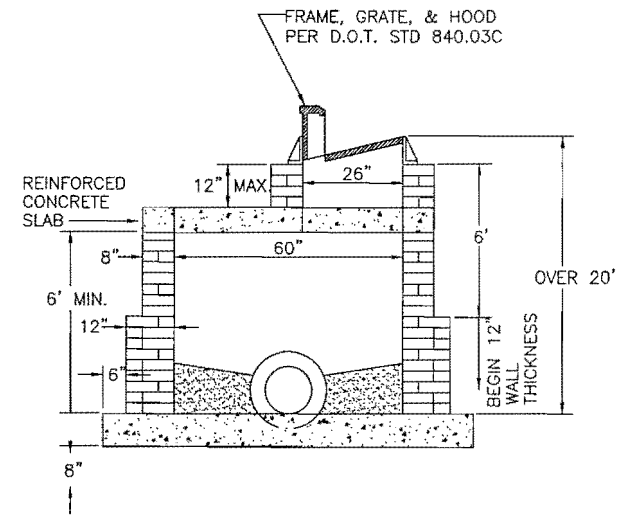
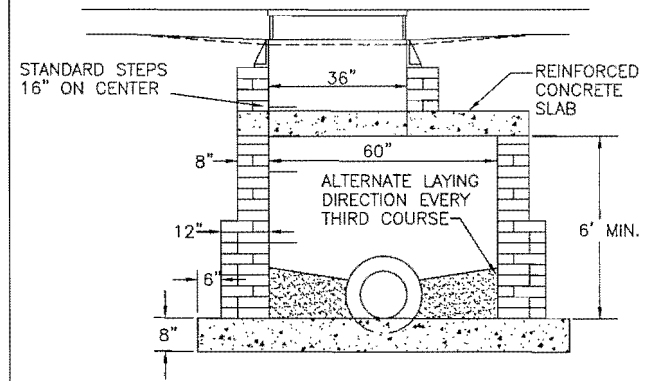


SLAB DETAIL

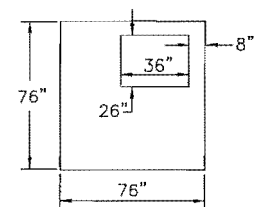


SLAB THICKNESS AND REINFORCEMENT FOR SOIL AND TRAFFIC LOADING BY AN ENGINEER

DEEP TYPE (5'X5')
(OVER 20 FEET IN DEPTH)



SLAB DETAIL



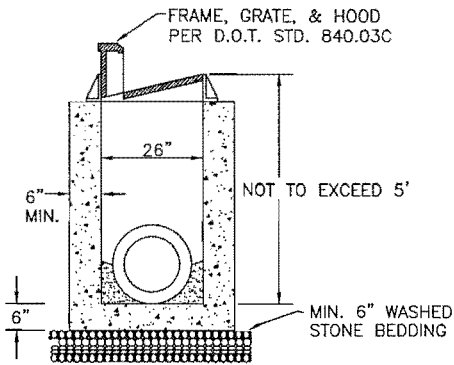
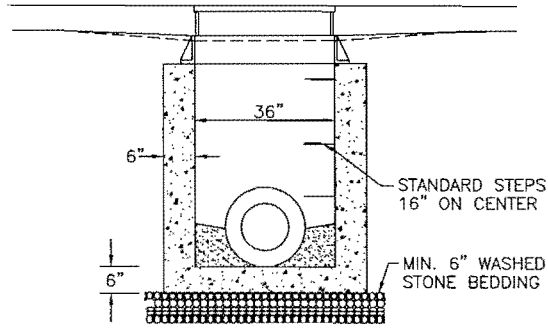
SLAB THICKNESS AND REINFORCEMENT FOR SOIL AND TRAFFIC LOADING BY AN ENGINEER

NOTES:

OVER 8' IN DEPTH, 12" WALL THICKNESS TO 6' FROM TOP OF WALL AND 8" BOTTOM SLAB SHALL BE USED.

Concrete Block or Brick Catch Basin	STANDARD DETAIL AND SPECIFICATIONS MANUAL	SMITHFIELD NORTH CAROLINA	

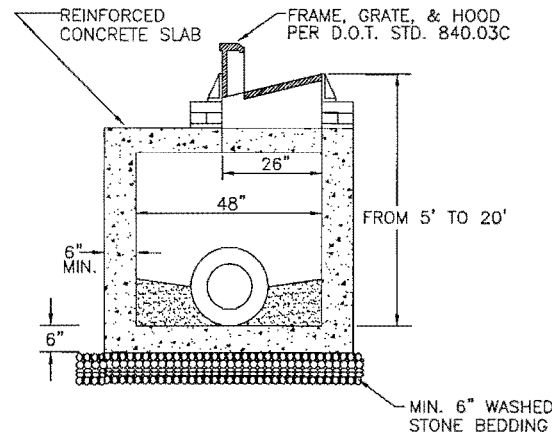
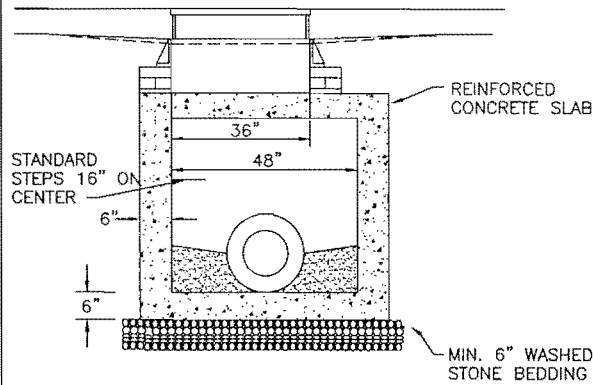
SHALLOW TYPE
(5 FEET OR LESS IN DEPTH)



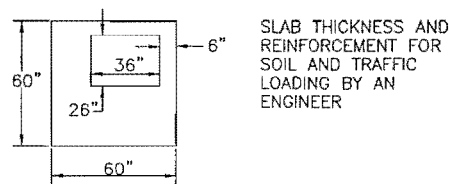
NOTES:

1. CONCRETE SHALL BE 4000 PSI MIN. FOR ALL PRECAST CONCRETE CATCH BASINS.
2. PRECAST CONCRETE STRUCTURES MAY ONLY BE INSTALLED TO DEPTHS CERTIFIED AS ACCEPTABLE BY THE MANUFACTURER.
3. "WAFFLE" BOXES ARE ACCEPTABLE FOR SHALLOW TYPE CATCH BASINS.

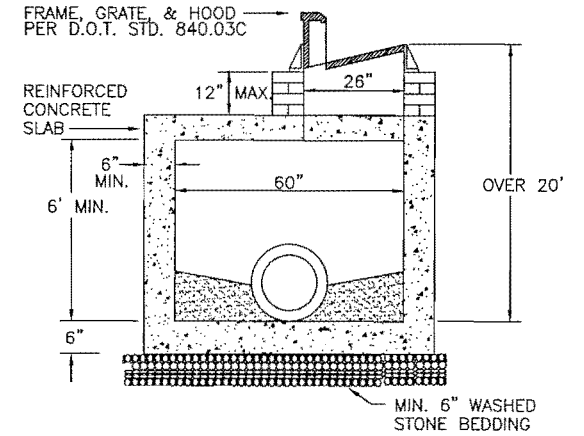
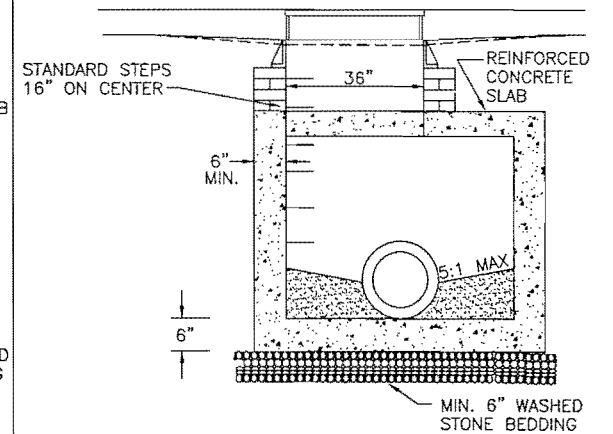
INTERMEDIATE TYPE (4'X4')
(5 FEET TO 20 FEET IN DEPTH)



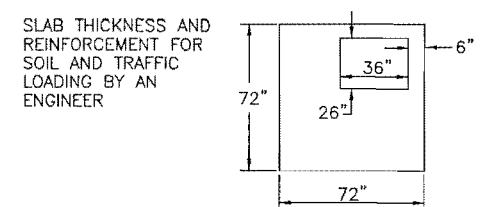
SLAB DETAIL




DEEP TYPE (5'X5')
(OVER 20 FEET IN DEPTH)

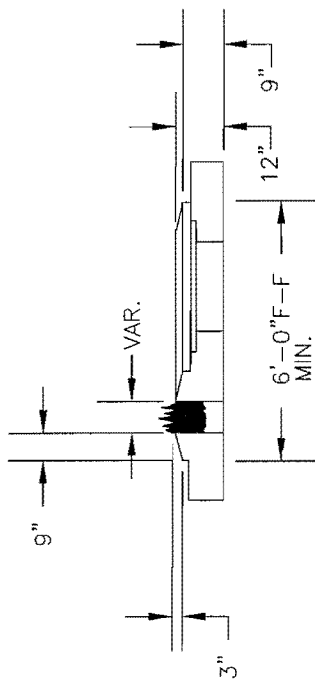


SLAB DETAIL



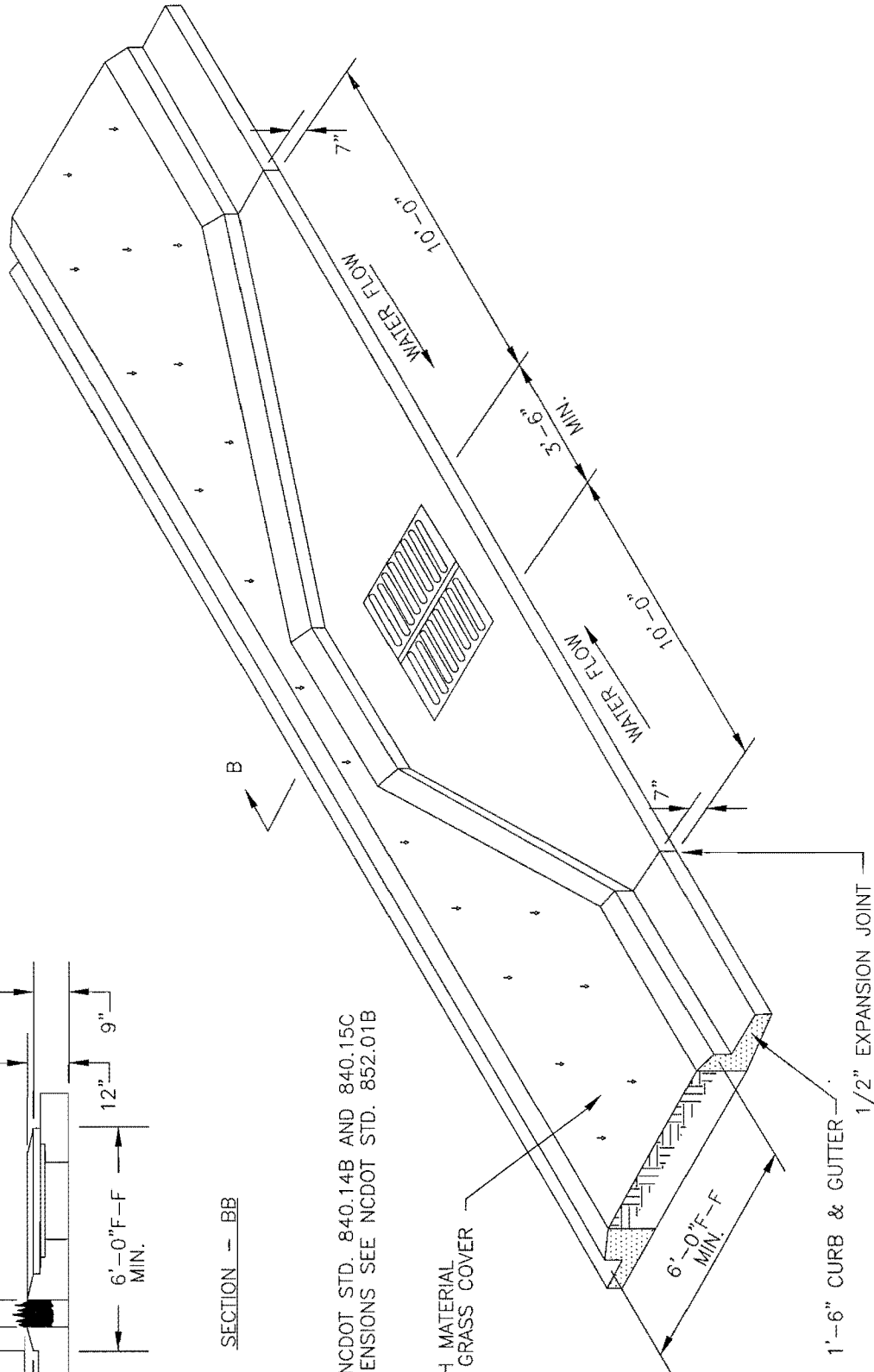
SMITHFIELD
NORTH CAROLINA
 STANDARD DETAIL AND SPECIFICATIONS MANUAL
 Precast Concrete Catch Basin
 Drawing 0803B
 Date 1/17/2000





SECTION -- BB

FOR USE WITH NCDOT STD. 840.14B AND 840.15C
 FOR ISLAND DIMENSIONS SEE NCDOT STD. 852.01B



EARTH MATERIAL
 WITH GRASS COVER

1'-6" CURB & GUTTER
 1/2" EXPANSION JOINT

**SMITHFIELD
 NORTH CAROLINA**

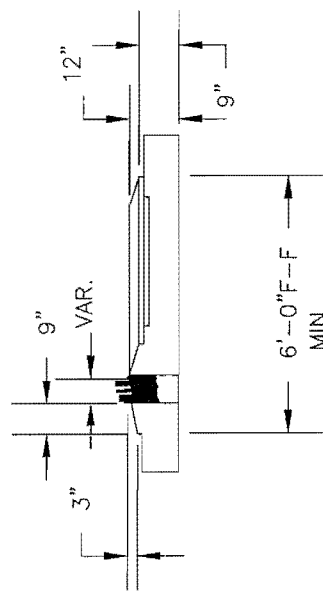


STANDARD DETAIL AND
 SPECIFICATIONS MANUAL

Drawing
 0804B

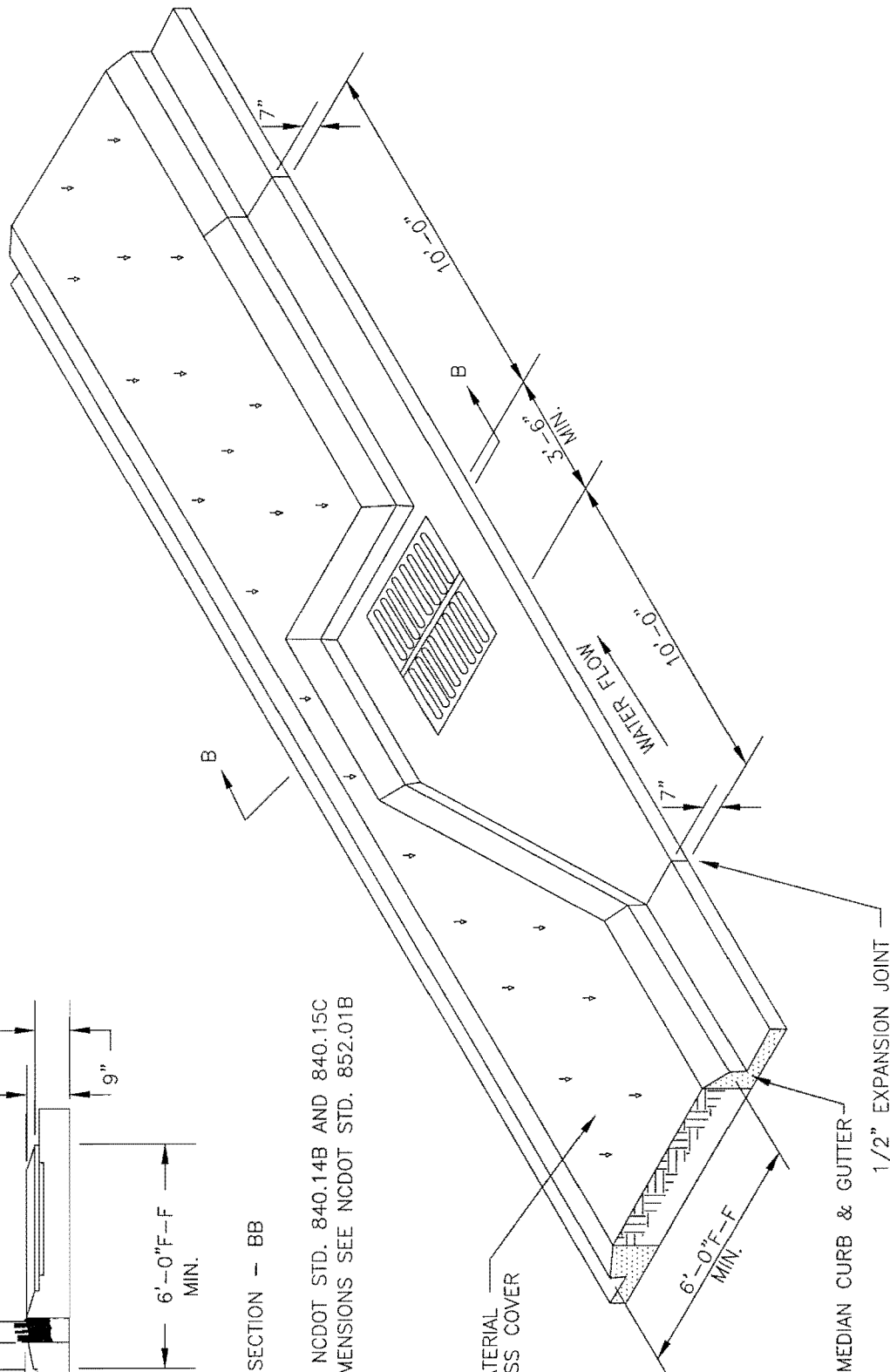
Standard Median
 Curb Inlet

Date
 1/17/2000



SECTION - BB

FOR USE WITH NCDOT STD. 840.14B AND 840.15C
 FOR ISLAND DIMENSIONS SEE NCDOT STD. 852.01B



EARTH MATERIAL
 WITH GRASS COVER

MEDIAN CURB & GUTTER

1/2" EXPANSION JOINT

**SMITHFIELD
 NORTH CAROLINA**



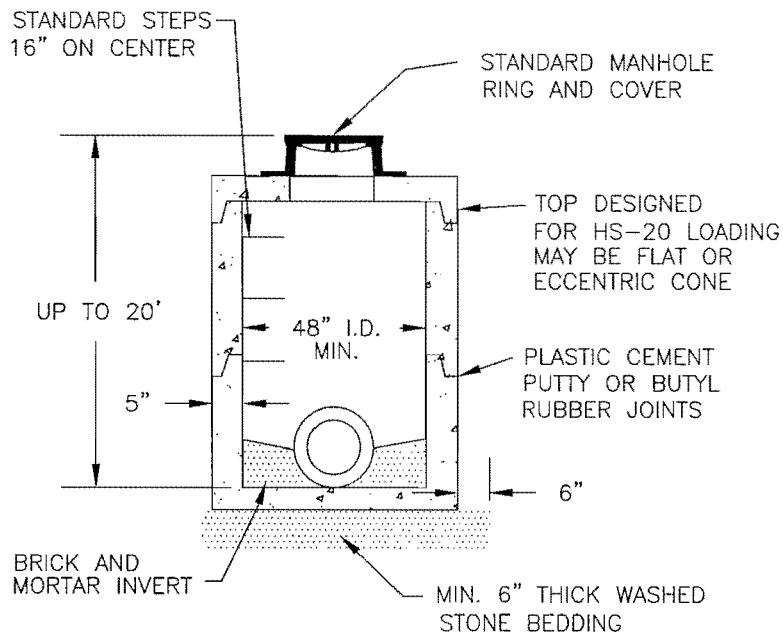
STANDARD DETAIL AND
 SPECIFICATIONS MANUAL

Drawing
 0804C

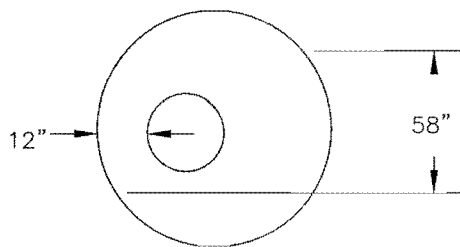
Standard Median
 Curb Inlet

Date
 1/17/2000

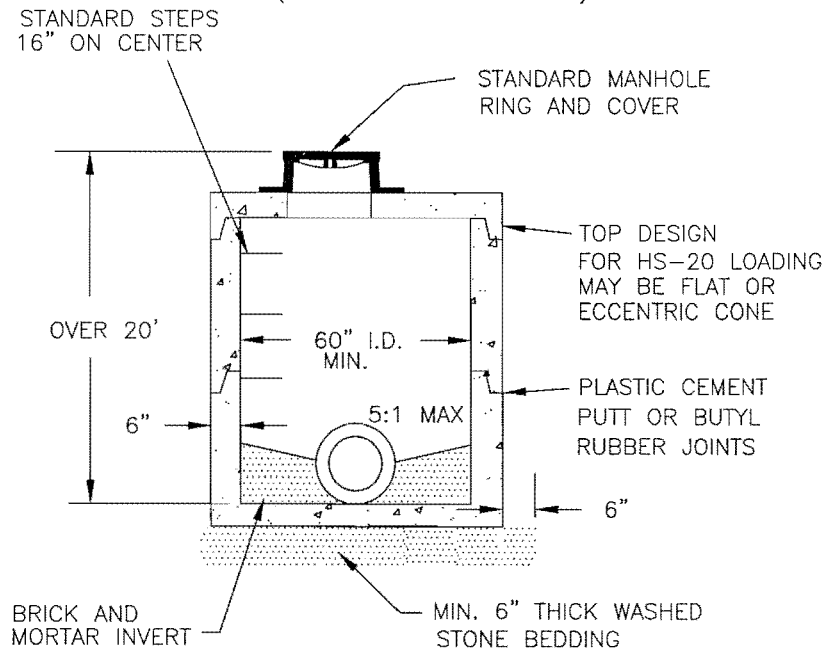
STANDARD TYPE
(UP TO 20 FEET IN DEPTH)



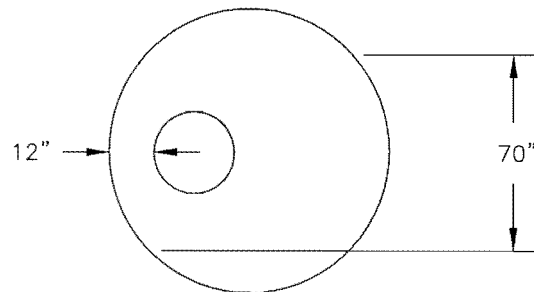
FLAT TOP DETAIL



DEEP TYPE
(OVER 20 FEET IN DEPTH)



FLAT TOP DETAIL



SMITHFIELD
NORTH CAROLINA

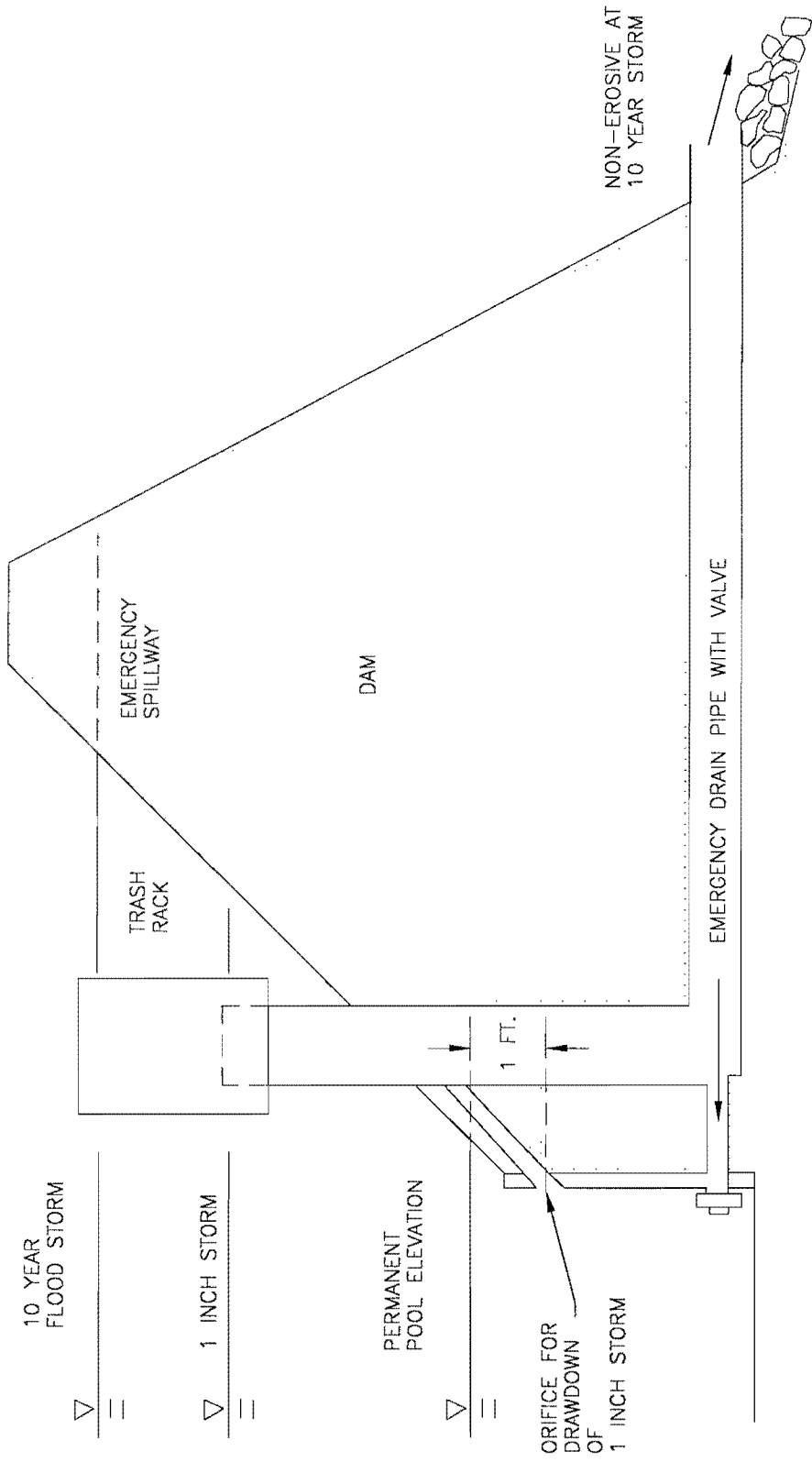


STANDARD DETAIL AND
SPECIFICATIONS MANUAL

Drawing
0805

Precast Concrete
Manhole Junction Box

Date
1/18/2000



**SMITHFIELD
NORTH CAROLINA**

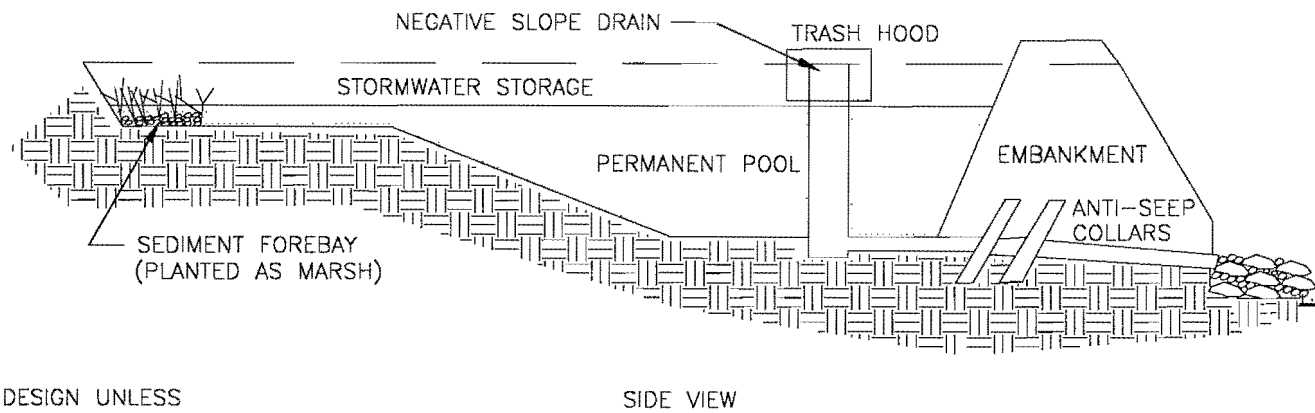
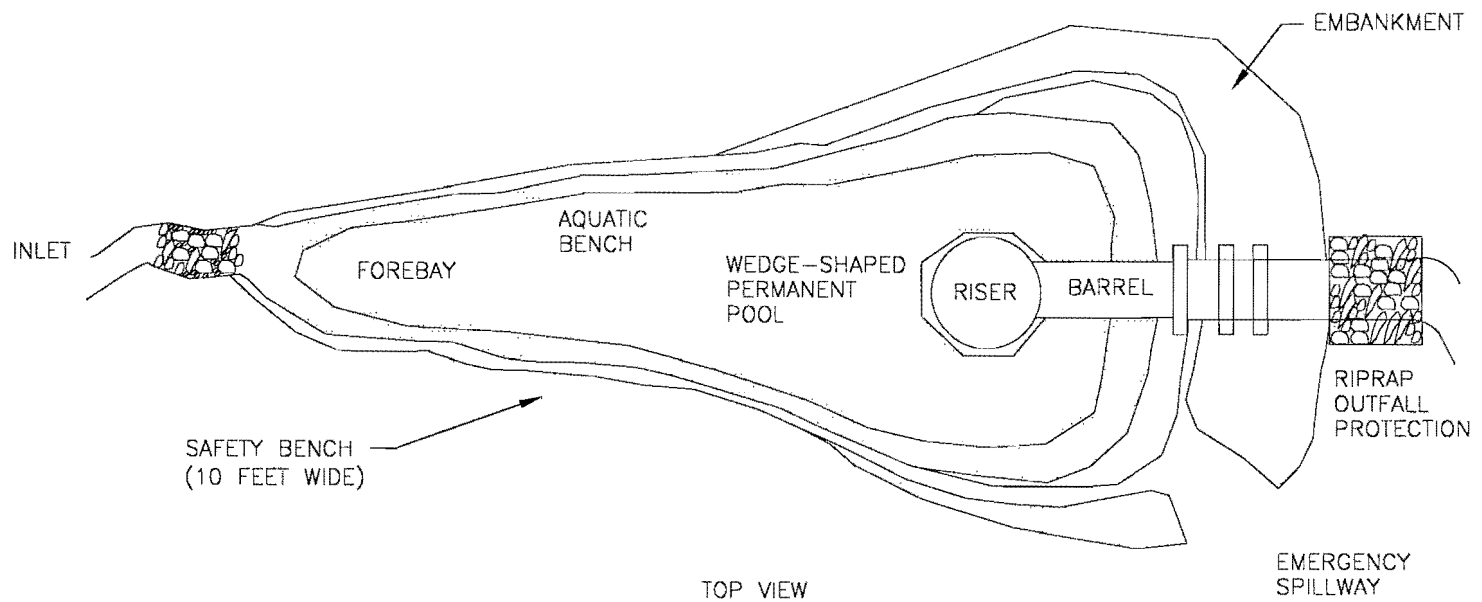


**STANDARD DETAIL AND
SPECIFICATIONS MANUAL**

Drawing
Figure-1

Wet Detention
Basin

Date
1/18/2000



REQUIRED DESIGN UNLESS
OTHERWISE APPROVED BY TOWN COUNCIL

SMITHFIELD
NORTH CAROLINA

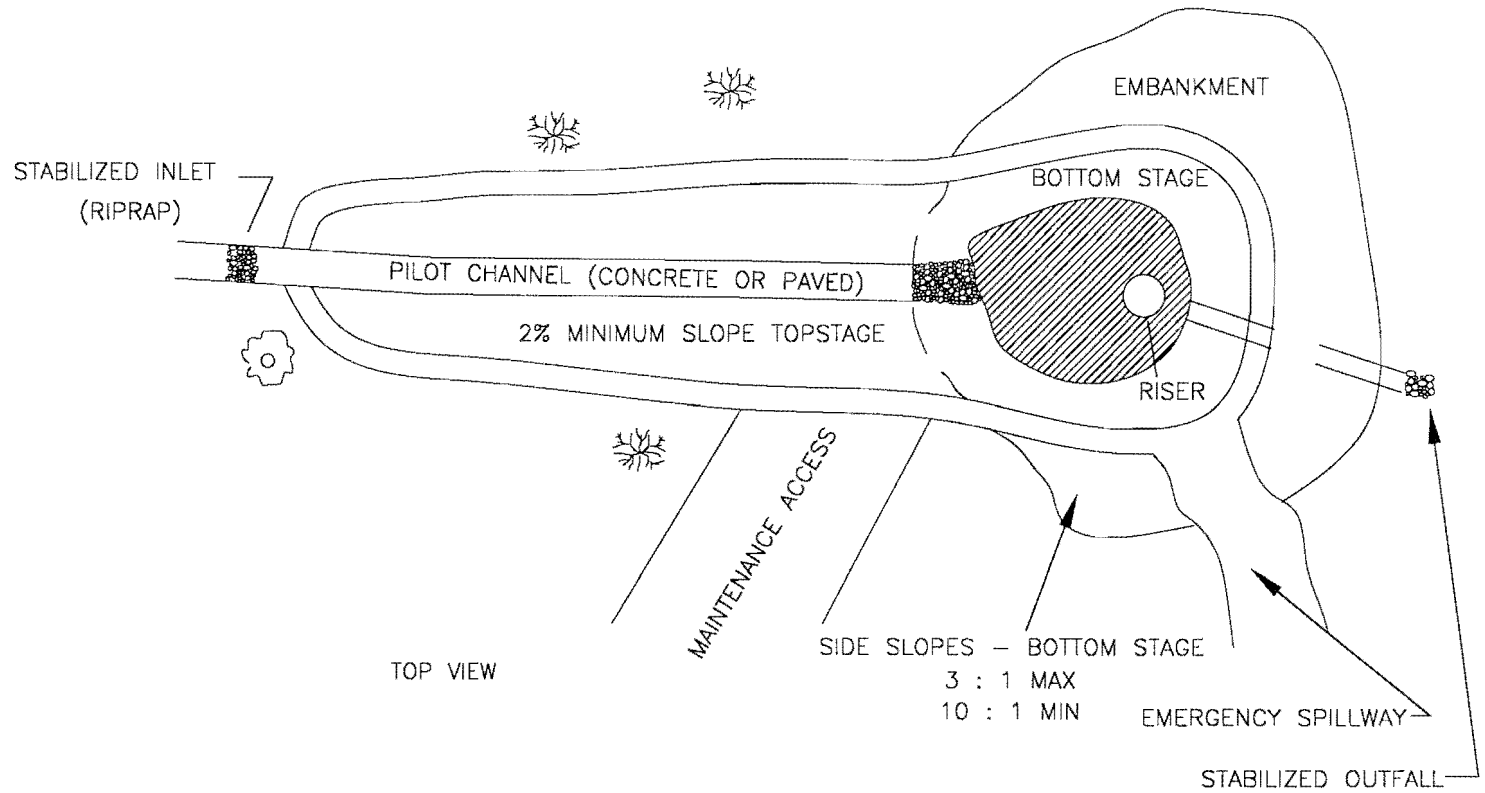


STANDARD DETAIL AND
SPECIFICATIONS MANUAL

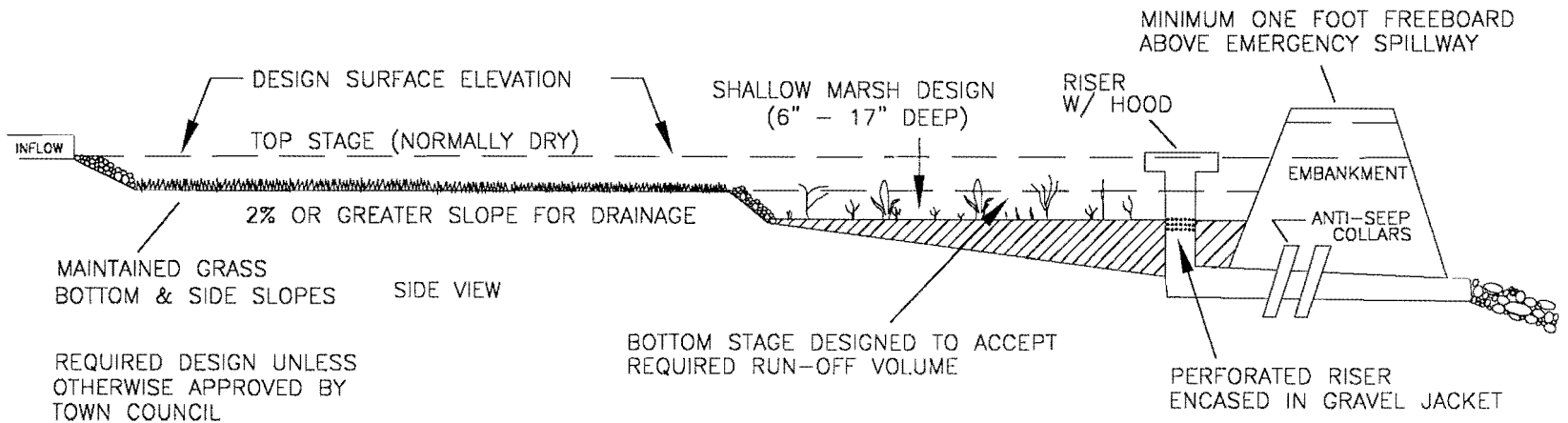
Wet Detention
Basin Design

Drawing
Figure-2

Date
1/18/2000




TOP VIEW



SIDE VIEW

REQUIRED DESIGN UNLESS OTHERWISE APPROVED BY TOWN COUNCIL

SMITHFIELD NORTH CAROLINA	
STANDARD DETAIL AND SPECIFICATIONS MANUAL	Drawing Figure-3
Dry Detention Basin Design	Date 1/18/2000
	

SECTION 9.00
'AS-BUILT' DRAWING REQUIREMENTS

All entities who construct public waterlines or facilities, public sewer lines or facilities, or public streets to be maintained by the Town of Smithfield shall submit to the Town of Smithfield Construction Management Department an as-built set of construction drawings as a part of the Town's acceptance process. All plan sheets shall be 24" x 36" mylar. Lettering shall be bold, clear, and a minimum of 1/8" in height. All applicable listed below shall be included on all as-built drawings.

9.01 SITE DATA

- A. Acreage in total tract
- B. Average lot size
- C. Total number of lots
- D. Total linear footage and size of streets, water mains, sewer mains, number number of valves, fire hydrants and manholes.

9.02 GENERAL INFORMATION

- A. Boundary of tract by courses and distance with references
- B. Tie to N. C. grid coordinate system
- C. 500 scale vicinity map
- D. Scale of drawings and bar scale
- E. North arrow
- F. Location of benchmark with M.S.L. elevations
- G. Seal and signature of North Carolina registered P. E. or R.L.S.
- H. All easements identified and dimensioned.
- I. Statement designating drawings are "as-built".

9.03 STREETS (Public or Private)

- A. Horizontal alignment with radii, P.C.'s, and P.T.'s of all curves
- B. Vertical alignment with centerline grades, vertical curve lengths, and station and elevation of all PVC's and PVT's and centerline profile.
- C. Dimensioned right of way and street widths
- D. Pavement section
- E. Typical cross section

9.04 STORM DRAINAGE

- A. Outline of 100 year flood plain
- B. Pipe material
- C. Structure invert and top elevations
- D. Pipe size
- E. Pipe slope and distance
- F. Size of riprap dissipation pad
- G. Statement of stormwater velocity at all outlets
- H. Show permanent stormwater impoundments.
- I. Include maintenance clause from covenants for stormwater impoundments.

SMITHFIELD
NORTH CAROLINA



**STANDARD DETAIL AND
SPECIFICATIONS MANUAL**

Drawing
SPEC9_1

SECTION 9
"AS-BUILT" DRAWING REQUIREMENTS

Date
2/1/00

9.05 WATER SYSTEM

- A. Pipe material
- B. Pipe size
- C. Separation from sanitary and storm sewers
- D. Locations of valves, fire hydrants, meters, and blow-offs with distance references
- E. Certification by N.C.P.E. of Construction in accordance with state issued permits. In addition to certification on the plans, a separate certification sheet shall be provided.
- F. A separate, recorded easement dedication form for public line extensions outside right of way.

9.06 SANITARY SEWER SYSTEM

- A. Pipe material
- B. Pipe size
- C. Manhole top elevations
- D. Invert in and out elevations
- E. Pipe slope
- F. Clean-out locations with distances referenced
- G. Horizontal control (angles at manholes)
- H. 100-year flood plain elevation
- I. Certification by N.C.P.E. of Construction in accordance with state issued permits. In addition to certification on the plans, a separate certification sheet shall be provided.
- J. A separate, recorded easement dedication form for public line extensions outside right of way.

END OF SECTION 9.00

**SMITHFIELD
NORTH CAROLINA**



**STANDARD DETAIL AND
SPECIFICATIONS MANUAL**

Drawing
SPEC9_2

SECTION 9
"AS-BUILT" DRAWING REQUIREMENTS

Date
2/1/00